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NOTE

THIS third volume (1926-28) of *Mineralogical Abstracts* contains 1,632 abstracts. They are roughly grouped under the following headings:

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X-rays and Crystal-structure (pp. 15, 175, 243, 333, 423, 521).
Zeolites and Associated Minerals (p. 285).

In the preparation of the abstracts the indexing has been kept constantly in view. Many points receive a bare mention in the abstracts to ensure their inclusion in the index. It is hoped that by this means the searcher will be put in touch with the original literature. The Alphabetical Index (pp. 577-680) of *AUTHORS*, *SUBJECTS*, and *LOCALITIES* is preceded by a Topographical Index (pp. 557-576).

ERRATA.

Mineralogical Abstracts, vol. 2.

PAGE. LINE.

- 199 3* For CsICb_2 read CsICl_2
 514 4* For 8.38 read 9.10
 640 13 (col. 2) For 586 read 568
 653 1 (col. 2) For SIMON (C. v) read SIMSON (C. von)
 add SIMSON (C. von) v. SIMON (F.)

Mineralogical Abstracts, vol. 3.

- 6 12* For pri s read prisms
 50 15 For Természuttud read Természettud
 56 10* For Isère read Savoie
 107 6 For Carélie read Carelie
 — 10 For waraka read varaka
 113 15* For GUIMARAES read GUIMARÃES
 139 1 For Bodioso read Bodiosa
 145 14 For Владикавказского read Владикавказского
 151 4 For no. — read no. 9
 168 15 For Johnson read Johnston
 176 9 For beama s read beam as
 188 18 For pp. 29-31 read pp. 28-31
 195 9 For orthoclase, microcline, and anorthoclase read orthoclase
 and microcline
 203 5 For DE ANGELIS read DE-ANGELIS
 208 5 For CARROBI read CAROBBI
 209 7 dele [province]
 233 22 For Foumarierite read Fourmarierite
 247 15* For $D^{1\frac{5}{2}}$ read $D^{1\frac{5}{4}}$
 251 16 For $V^{1\frac{2}{2}}$ read $V^{1\frac{2}{4}}$
 346 4 For Zr_2SiO_4 read ZrSiO_4
 351 2 For no. — read no. 4
 368 17 For vanuxenite read 'vanuxénite' [i.e. vanuxemite]
 369 12* For boemite read boehmite
 395 2* For Špani Dolina read Španá Dolina
 405 1 For Durinsky read Darinsky
 408 16 For Atakpané read Atakpamé
 441 20 Add 1927
 443 9 For Fossile read fossile
 448 14* For Moranevsky read Morachevsky

* From bottom of page.

MINERALOGICAL ABSTRACTS

(Vol. 3, No. 1, March 1926.)

Notices of Books.

NIGGLI (Paul). *Versuch einer natürlichen Klassifikation der im weiteren Sinne magmatischen Erzlagerstätten*. Abhandlungen zur praktischen Geologie und Bergwirtschaftslehre, herausg. von Georg Berg. Halle (W. Knapp), 1925, vol. 1, 69 pp., 11 figs. Price 4-80 Mk.

It is refreshing to find, as one does in this brochure, a petrologist emphasizing the fact that the study of igneous ore-deposits is essentially bound up with that of igneous rocks—'Die Probleme der Erzlagerstättenforschung sind Teilprobleme der Eruptivgesteinsforschung.' This, however, is only a half-truth. Perhaps in due course will come the fuller refreshment provided by the recognition of the whole truth. Meanwhile, the world will have to suffer as gladly as it can the igneous enthusiast in matters relating to ore-genesis, just as it has had to suffer so long his counterpart in petrology. Niggli's treatment of the subject is on conventional lines. Assuming the igneous origin of ore-deposits, he proceeds to deal with (1) the physical chemistry of ore-forming magmas; (2) the mineralogical-chemical types of magmatic ore-deposits; and (3) the associations of magmatic ore-deposits, including in this the consideration of ore-deposits in relation to petrographic provinces. The book includes numerous references to recent literature on the subject, and can be recommended as a good account of the origin and classification of ore-deposits from the physico-chemical and igneous-petrological points of view.

T. C.

ROSENBUSCH (H.). *Mikroskopische Physiographie der Mineralien und Gesteine*. Band I, zweite Hälfte, spezieller Teil. *Die petrographisch wichtigen Mineralien*. 5th edit., by O. MÜGGE. Stuttgart (E. Schweizerbart), 1925, Lieferung 1, vii+276 pp., 9 pls., 28 text-figs. Price 24 Mk. [See Abstr., vol. 2, p. 413.]

A detailed description of minerals of petrographic importance which crystallize in the cubic, tetragonal, and hexagonal (and rhombohedral) systems. All the information contained in the fourth edition has been revised completely, and much more space is devoted to modes of

occurrence and to the physico-chemical relations of the minerals. Descriptions of twenty-two minerals not included in the fourth edition are added, and are illustrated by twenty-eight new photomicrographs. Detailed chemical analyses are given only when the formula is not known certainly or when there are important relations between chemical composition and physical properties. The numerous additions make this part of the book three times the size of the corresponding part of the fourth edition. Of the nine plates two are reproductions of Dr. Mügge's diagrams connecting extinction-angle with orientation for sections of tetragonal and hexagonal crystals. The remaining seven give forty-two excellent photomicrographs of minerals in thin sections of rocks.

W. C. S.

TOKOBY (László). *Kristályszerkesztés. Függelék: Bevezetés a kristálysámításba.* [Crystal-drawing. Appendix: Introduction to crystal-calculation.] Budapest ('Technika'), 1925, 123 pp., 136 figs. Price 84000 Kr.

This useful book, intended for students and beginners, deals very clearly and practically with the method of drawing crystals in parallel perspective. The figures are unfortunately badly printed. A short appendix (pp. 97-123) gives an explanation of the symbols of crystallography and an outline, with examples, of the calculation of crystals by the usual formulae of spherical trigonometry.

K. Z.

KRAUS (Edward Henry) & HOLDEN (Edward Fuller) [-1925]. *Gems and gem materials.* New York & London (McGraw-Hill Book Co.), 1925, vii + 222 pp., 256 figs. Price 15s.

This book is based on the course of lectures on precious stones that has been given for the past ten years in the mineralogical school of the University of Michigan, and the subject is treated from a mineralogical point of view. It forms a companion volume to Kraus and Hunt's 'Mineralogy', 1920 [Abstr., vol. 1, p. 116], and much of the matter and several of the figures are taken from that work. Part I (pp. 9-104) deals with crystal forms; physical, optical, and chemical characters; occurrence and production; cutting, polishing, and naming of gems; and the artificial production and imitation of stones. Part II (pp. 107-188) gives descriptions of the individual gem-minerals. In a series of useful tables the gem-minerals are arranged according to their system of crystallization, hardness, specific gravity, colour, optical character, mean refraction and birefringence, dispersion, pleochroism, and chemical composition. Another table in which the minerals are arranged alpha-

betically gives a concise summary of all these characters. The book is well printed and illustrated. Some interesting pictures are given of diamond-cutting machinery in works in New York. L. J. S.

EITEL (W.). *Über die Synthese der Feldspatvertreter*. Preisschr. Fürst. Jablonowsk. Gesell., no. 52, Leipzig (Akad. Verlagsgesell.), 1925, vii + 258 pp., 4 pls., 50 text-figs. Price 25 M.

This prize essay gives a detailed review of the literature on the synthesis of the felspathoid minerals (leucite, nepheline, gehlenite, melilite, cancrinite, scapolite, &c.), with a discussion of the equilibrium diagrams of the systems in which they have been obtained by fusion. The systems $\text{CaO} - \text{CO}_2$, $\text{Na}_2\text{CO}_3 - \text{CaCO}_3$, and of these with nepheline, anorthite, &c. [Abstr., vol. 2, pp. 427-428], are also dealt with. The bearing of these experiments on the paragenesis of these minerals in natural rocks is considered. L. J. S.

EITEL (Wilhelm). *Physikalisch-chemische Mineralogie und Petrologie. Die Fortschritte in den letzten zehn Jahren*. Wissenschaftliche Forschungsberichte, Naturwiss. Reihe, vol. 13, Dresden & Leipzig (Theodor Steinkopff), 1925, viii + 174 pp., 53 figs. Price 8 M. (bound 9.20 M.).

This is a very condensed summary of the extensive literature during the past ten years, and it appears to have been compiled, in part at least, from abstracts. Detailed bibliographical references to the original literature are given in numerous footnotes. A wide range of matters is dealt with—The principles of equilibrium, modification changes, two and more component systems, synthesis of minerals, relations between optical constants and chemical composition in silicates, magmatic gases, pegmatitic-pyrohydatogenic-hydrothermal processes, zeolites, weathering, colloid mineralogy, salt deposits, rock metamorphism, &c., all of which are treated from a physical-chemical point of view. There are good indexes of authors and subjects, and the book will be useful for quick reference. L. J. S.

New Minerals.

PIED (H.). *Comptes rendus de publications étrangères et minéraux nouveaux*. Bull. Soc. Franç. Min., 1924, vol. 47, pp. 117-122.

ORCEL (J.). *Revue des espèces minérales nouvelles*. Ibid., pp. 173-174.

GAUBERT (P.) & ORCEL (J.). *Revue des espèces minérales nouvelles*. Ibid., pp. 358-360.

- Compte rendu de publications étrangères et minéraux nouveaux.* Bull. Soc. Franç. Min., 1925, vol. 48, pp. 85-89.
- ORCEL (J.). *Minéraux nouveaux.* Ibid., p. 238.
- WHERRY (Edgar T.). *Classified list of minerals described or discredited during 1921.* Amer. Min., 1924, vol. 9, p. 34. . . . during 1922. Ibid., p. 175.
- SCHWANTKE (Arthur). *Neue Mineralien.* Fortschr. Min. Krist. Petr., 1925, vol. 10, pp. 89-118.
- SPENCER (L. J.). *Tenth list of new mineral names; with an index of authors.* Min. Mag., 1925, vol. 20, pp. 444-477.

HARRISON (Sir John B.) [1856-1926]. *An occurrence of palladium and rhodium in British Guiana.* Official Gazette, British Guiana, May 2, 1924, no. 181, 2 pp.

The diamond-bearing gravels near Oewang, near the Kaïeteur gorge, Potaro River, yield a black concentrate of ilmenite sand with specks of gold and a few minute grains (total weight 44 mg.) of a white metal. This is malleable but somewhat brittle, and is slowly dissolved by hot strong nitric acid or aqua regia giving a rose-red solution. A small amount of ammonium iridio-chloride was separated, and the tests indicate the presence of palladium and rhodium in variable amounts in the different grains. [One grain from this locality has been identified as platinum, Min. Mag., 1924, vol. 20, pp. 186, 217.] L. J. S.

HARRISON (J. B.) & BOURNE (C. L. C.). *The occurrence of palladium amalgam—palladium mercuride—in British Guiana.* Official Gazette, British Guiana, February 27, 1925, no. 71, 3 pp.

A further small supply of the white metal as fragments and nuggets up to 12 grams in weight has been found in the diamond-washings of the Kangaruma district, Potaro River (16 miles from the locality previously mentioned). These have sp. gr. 13.33-15.82 and lose in weight when heated, with further losses on successive heatings up to about 1400° C. The residual metal (34.8-45.6 %) is porous with sp. gr. 10.0-11.0 (after hammering, 11.33-11.9), and consists of palladium with traces of rhodium, platinum, and gold. It was afterwards found that the loss is due to mercury (54.4-65.2 %). A re-examination of the material previously described as palladium and rhodium (preceding abstract) also showed the presence of much mercury; and it is suggested

that that described as 'allopalladium' (Min. Mag., 1924, vol. 20, p. 217)¹ is also the same. The material is hard (scratching rolled nickel), possesses a crystalline structure, and has a density greater than that of palladium or mercury. Mercury has not previously been reported from British Guiana, but recently a small piece of cinnabar has been found in a lateritic clay in the Kurupung district.

L. J. S.

AMINOFF (G.). *Über Berylliumoxyd als Mineral und dessen Kristallstruktur.* Zeits. Krist., 1925, vol. 62, pp. 113-122, 5 figs.

White hexagonal crystals occurring with swedenborgite [Abstr., vol. 2, p. 338] at Långban, Sweden, are insoluble in acids and not attacked by alkali carbonate. The material is dissolved after fusion with acid potassium sulphate, and analysis by G. K. Almström gave BeO 98.02, CaO 1.03, BaO 0.55, MgO 0.07, MnO trace, Sb₂O₃ 0.29, Al₂O₃ 0.14, ign. 0.85 = 100.68; sp. gr. 3.017. The forms are (10 $\bar{1}$ 0) and (0001), and one crystal showed pyramid-faces (10 $\bar{1}$ 1) at one end only; (0001):(10 $\bar{1}$ 1) = 62° 0', $a:c = 1:1.6288$. The crystals are pyroelectric, and the class is dihexagonal-pyramidal. Hardness about 9. Optically uniaxial and positive, ω 1.719, ϵ 1.733. X-ray analysis, by the powder method and by rotating a crystal about the a and c axes, gave $a = 2.68$, $c = 4.36$ Å. with two molecules in the unit cell [cf. BeO, p. 20]. The structure is of the zinc oxide type. The new mineral is named *bromellite*.

L. J. S.

AMINOFF (G.). (Mit einer chemischen Analyse von G. Karl Almström.)

Über ein neues oxydisches Mineral aus Långban. (Magnetoplumbite.)

Geol. För. Förh. Stockholm, 1925, vol. 47, pp. 283-289, 4 figs.

This occurs abundantly in a manganophyllite skarn as acute hexagonal pyramids with a black colour, brilliant metallic lustre, and perfect basal cleavage. The streak is brown; sp. gr. 5.517, H. about 6, (0001):(10 $\bar{1}$ 1) = 77° 31', $a:c = 1:3.91(2)$. X-ray analysis shows it to be holohedral hexagonal with a unit cell of dimensions a 6.06, c 23.69 Å. containing four molecules $2\text{RO} \cdot 3\text{R}_2\text{O}_3$. The mineral is difficultly soluble in hydrochloric acid. Analysis gave: PbO 19.74, TiO₂ 4.82, Fe₂O₃ 54.65, Al₂O₃ 0.88, Cr₂O₃ 0.05, MnO 17.33, CaO 0.35, MgO 0.47, K₂O 0.14, Na₂O 0.16, H₂O 0.26, SiO₂ 0.15, insol. 0.52, total 99.52. This gives the ratios $2(\text{R}''\text{O} + \text{R}'\text{O}):2.8(\text{R}'''\text{O}_3 + \text{R}''\text{TiO}_3)$ which may be $2\text{RO} \cdot 3\text{R}_2\text{O}_3$ or $3\text{RO} \cdot 4\text{R}_2\text{O}_3$, the X-ray data favouring the former. The

¹ This suggestion is well founded. Heating a fragment of the 'allopalladium' from British Guiana in a bulb-tube, a good sublimate of mercury was obtained. The doubt now passes on to the original allopalladium from the Harz Mts.—L. J. S.

mineral is related to plumbosferrite ($\text{PbO} \cdot 2\text{Fe}_2\text{O}_3$), but differs from this in being strongly magnetic. L. J. S.

ALMSTRÖM (G. Karl). *Om akrochorditens kemiska sammansättning*. Geol. För. Förh. Stockholm, 1923, vol. 45, pp. 117-118.

The formula $\text{Mn}_3\text{As}_2\text{O}_8 \cdot \text{MnOH} \cdot \text{MgOH} \cdot 5\text{H}_2\text{O}$ or $\text{Mn}_4\text{Mg}(\text{AsO}_5)_2 \cdot 6\text{H}_2\text{O}$ for akrochordite [Abstr., vol. 2, p. 51] is written graphically in two ways. L. J. S.

SCHOEP (Alfred). *Sur la buttgenbachite, nouveau minéral*. Compt. Rend. Acad. Sci. Paris, 1925, vol. 181, pp. 421-423.

This was found as a felt of sky-blue needles with native silver in cavities in cuprite from Likasi, Belgian Congo. The needles give straight extinction, n (\parallel length) 1.747, \perp length slightly higher; it could not be determined whether the crystals are uniaxial or biaxial. Sp. gr. 3.33. Between 290° and 310° C. nitrous fumes, water, and cuprous chloride are given off. Analysis gave CuO 71.56, Cl 6.02, N_2O_5 5.40, SO_3 nil, H_2O 17.34, total (less O for Cl) 99.04. The empirical formula is written as ' $18\text{CuO} \cdot 3\text{Cl} \cdot \text{N}_2\text{O}_5 \cdot 19\text{H}_2\text{O}$ '. The mineral resembles and is analogous to connellite with nitrate in place of sulphate. L. J. S.

SCHOEP (Alfred). *Nouvelles recherches sur la dewindtite: biréfringence, composition chimique et déshydratation de ce minéral. Comparaison avec la dumontite*. Bull. Soc. Franç. Min., 1925, vol. 48, pp. 77-85, 1 pl.

Dewindtite [Abstr., vol. 1, p. 377] occurs with torbernite at Chinkolobwe, Belgian Congo, in compact and powdery forms, and as minute (0.09×0.04 mm.) crystals. The last form is now considered to be identical with stasite [Abstr., vol. 1, p. 377]. These crystals are orthorhombic and have the form of short prisms flattened parallel to the a -axis and terminated by (001). Cleavage (100). The optic axial plane is (001) and the sign positive; $2E$ large, α 1.762, β 1.763, $\beta - \alpha$ (determined directly) 0.004. A new analysis of crystals, UO_3 54.80, PbO 24.85, P_2O_5 10.14, H_2O 7.93, gives the new formula $3\text{PbO} \cdot 5\text{UO}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 12\text{H}_2\text{O}$. These characters are compared with those of dumontite [Abstr., vol. 2, p. 383]. The dehydration curves of dewindtite and dumontite also show differences. L. J. S.

BUTTGENBACH (H.). *La droogmansite, nouvelle espèce minérale*. Ann. Soc. Géol. Belgique, 1925, vol. 48, Bull. pp. B 219-B 221.

This occurs with sklodowskite and curite at Kasolo, Katanga, as small orange-yellow globules with a radially fibrous structure. The separate

fibres are flattened parallel to a perfect cleavage, perpendicular to which is an acute positive bisectrix with wide axial angle. Pleochroism is not perceptible; $n > 1.74$. The mineral is readily soluble in hydrochloric acid and contains no phosphate. These characters distinguish it from curite, sklodowskite, dumontite, dewindtite, and kasolite, and it is believed to represent a new species [presumably uraniferous]. L. J. S.

KRENNER (József)† [1839–1920]. *Kornelit*. [Abbreviated translation:]

KRENNER (Josef) *Kornelit*. Math. és Természettud. Értesítő, Budapest, 1926, vol. 42, pp. 1–2 (Hung.), p. 3 (Germ.), 1 fig.

A preliminary description of this mineral was given by Krenner in 1888 (A Magyar Tudom. Akadémia Értesítője, 1888, vol. 22, p. 131 [see Dana's 6th edit., p. 957]), and the present notes have recently been found amongst his papers. It occurs as a secondary mineral with voltaite and coquimbite in the pyrites mines of Szomolnok, Co. Szepes [cf. Min. Mag., 1910, vol. 15, pp. 429, 431]. The globular aggregates of fibres are pale-rose or violet in colour with silky lustre. The fibres (30–40 mm. long and 0.5 mm. thick) are orthorhombic with prism-angle $(110):(1\bar{1}0) = 52^\circ 2'$, but no terminal faces. The optic axial plane is parallel to the cleavage $b(010)$, and the acute positive bisectrix parallel to the a -axis; $2E = 84^\circ 12' (Na)$, with brightly coloured interference-figure, $\rho > v$. Analysis by J. Loczka (see abstract below). K. Z.

KRENNER (József)† [1839–1920]. *Warthait, egy új ásvány Magyarországból*. KRENNER (Josef). *Warthait, ein neues Mineral aus Ungarn*. Math. Termés. Ért. 1926, vol. 42, p. 4 (Hung.), p. 5 (Germ.).

This new mineral, from the Theresia iron mine at Vaskő, Co. Krassó-Szörény, is the bismuth sulphosalt of the jordanite-meneghinite group. It is steel-grey with metallic lustre, and forms thin radially fibrous bundles in crystalline limestone with associated blende, pyrite, and haematite. Analysis by J. Loczka (see following abstract). K. Z.

LOCZKA (József)† [1855–1912]. *Ásványelemzések*. [Abbreviated translation:] LOCZKA (Josef). *Mineralanalysen*. Math. Termés. Ért. 1926, vol. 42, pp. 6–17 (Hung.), pp. 20–21 (Germ.).

(1) *Kornelite*.—This violet-coloured mineral gives a white streak and powder. It is soluble in water. Sp. gr. 2.306. Analysis, SO_3 44.55, Fe_2O_3 30.17, CuO 0.06, Na_2O 0.11, K_2O 0.09, $(NH_4)_2O$ 0.03, FeO , CuO , P_2O_5 traces, H_2O 24.92, gives the formula $Fe_2(SO_4)_3 \cdot 7\frac{1}{2}H_2O$. (2) *Warthait*.—Sp. gr. 7.163. Analysis, Bi 28.18, As trace, Pb 54.53, Ag 1.01, Cu 1.05, Fe 0.17, S 15.31, gives the formula $4(Pb, Cu, Ag)S \cdot Bi_2S_3$ [the same as for goongarrite; Abstr., vol. 2, p. 336]. (3) *Cosalite*.—Needles and fibres

in dolomitic carbonate from Vaskő, Co. Krassó-Szörény. Sp. gr. 7.13. Analysis: Bi 42.34, Pb 36.23, Ag 1.50, Cu 3.41, Fe 0.19, S 16.33. (4) *Semseyite*.—This occurs at Kisbánya, Co. Szatmár, with galena, pyrrhotine, pyrite, blende, fizelyite, quartz, and dolomite. Sp. gr. 6.05. Analysis, Sb 28.34, Pb 52.49, Ag 0.13, Cu 0.06, Fe 0.06, S 18.93, insol. 0.21, gives approximately the formula $13\text{PbS} \cdot 6\text{Sb}_2\text{S}_3$. K. Z.

KRENNER (József) & LOCZKA (József). *Fizélyit, egy új magyar ezüstérc*. [Fizelyite, a new Hungarian silver-ore.] Math. Termész. Ért. 1926, vol. 42, pp. 18–19, 21. [cf. Min. Mag., 1916, vol. 17, p. 350.]

This new mineral occurs with semseyite at Kisbánya, Co. Szatmár. It forms dark lead- or steel-grey prisms (8 mm. long and $1-1\frac{1}{2}$ mm. thick) which are deeply striated and have no terminal faces. The lustre is metallic and the streak dark-grey; very brittle, H. = 2, cleavage (010). Analysis, Sb 34.02, As 0.32, Pb 37.48, Ag 7.70, Fe 0.62, S 20.10, insol. 0.30, gives approximately the formula $5\text{PbS} \cdot \text{Ag}_2\text{S} \cdot 4\text{Sb}_2\text{S}_3$. K. Z.

PALACHE (Charles) & VASSAR (Helen E.). *Some minerals of the Keweenaw copper deposits: pumpellyite, a new mineral; sericite; saponite*. Amer. Min., 1925, vol. 10, pp. 412–418.

Pumpellyite occurs with native copper, epidote, chlorite, quartz, prehnite, &c., in the cavities and as a later replacement in the amygdaloidal rocks of several copper mines in the Keweenaw Peninsula, Michigan. It forms minute fibres or laths of a bluish-green colour, and has a perfect (basal) cleavage parallel to the flat surface. The optical characters, which are near to those of zoisite, indicate orthorhombic symmetry: α 1.698, β 1.700, γ 1.708, positive; α 'nearly normal' to the perfect cleavage, β parallel to the length of the fibres. Sp. gr. nearly 3.2, H. $5\frac{1}{2}$. Analysis, SiO_2 37.18, Al_2O_3 23.50, Fe_2O_3 5.29, FeO 2.09, MnO 0.13, MgO 3.18, CaO 23.08, Na_2O 0.19, K_2O trace, $\text{H}_2\text{O}(+)$ 6.28, $\text{H}_2\text{O}(-)$ 0.06, total 100.97, gives the formula $6\text{CaO} \cdot 3\text{Al}_2\text{O}_3 \cdot 7\text{SiO}_2 \cdot 4\text{H}_2\text{O}$, differing in its ratios from those of zoisite and prehnite. Chemical analyses and optical data are also given of the associated sericite (greenish, unctuous, minutely crystalline masses) and saponite. Two analyses of the saponite give the formula $\text{Al}_2\text{O}_3 \cdot 9\text{MgO} \cdot 10\text{SiO}_2 \cdot 16$ (or 15) H_2O . L. J. S.

LARSEN (Esper S.) & WHERRY (Edgar T.). *Beidellite, a new mineral name*. Journ. Washington Acad. Sci., 1925, vol. 15, pp. 465–466.

ROSS (Clarence S.) & SHANNON (Earl V.). *The chemical composition and optical properties of beidellite*. Ibid., pp. 467–468.

A gouge-clay from Beidell, Saguache Co., Colorado, previously described

as leverrierite [Abstr., vol. 2, p. 133], is now named beidellite. It is a metasilicate with the formula $\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2 \cdot n\text{H}_2\text{O}$, where n is about 4, coming between kaolinite and pyrophyllite. It is optically negative with small axial angle ($2E$ nearly 0 to 24°), α 1.494, β and γ 1.536, and is probably orthorhombic. Some other gouge-clays are also referred to beidellite; for example, one from Black Jack mine, Owyhee Co., Idaho [Abstr., vol. 2, p. 134]. The mineral also occurs as an alteration of zeolites, and as the base of some bentonites. A pistachio-green iron-beidellite, resulting from the alteration of volcanic ash at Spokane, Washington, has rather higher refractive indices; analysis, SiO_2 46.06, TiO_2 0.84, Al_2O_3 12.22, Fe_2O_3 18.54, FeO 0.28, CaO 1.66, MgO 1.62, H_2O 17.26, total 98.48, suggests an isomorphous series to $\text{Fe}_2\text{O}_3 \cdot 3\text{SiO}_2 \cdot n\text{H}_2\text{O}$.

L. J. S.

KIMURA (Kenjiro). *The chemical investigation of Japanese minerals containing rarer elements. Part IV. Analyses of zircon, xenotime and allanite of Ishikawa, Iwaki province.* Japanese Journ. Chem., 1925, vol. 2, pp. 73–79, 1 fig.

— *Part V. Analyses of fergusonite of Hagata, hagatalite of Hagata, and oyamalite of Oyama, Iyo province.* Ibid., pp. 81–85. [cf. Abstr., vol. 2, p. 380.]

Crystals of reddish-brown zircon (sp. gr. 4.3–4.4) and brownish-grey xenotime (sp. gr. 4.4) were washed from a stream near the Ishikawa hill in a pegmatite region. The two are intimately intermixed and intergrown. Sometimes a prismatic crystal of zircon is surrounded by a girdle of a pyramidal crystal of xenotime, the two being in parallel position. Zircon separated as far as possible from the surrounding xenotime gave analysis I (also MgO , CaO , MnO traces). Analysis II (also CaO 0.35) of a radial aggregate of xenotime (locally called 'kikukwaseki'—chrysanthemum-stone) shows it to be a mixture of xenotime and zircon. Allanite occurs very rarely in the pegmatite of Ishikawa. A tabular crystal showed the forms *a l d* [Dana's letters] and new *I* (104). Sp. gr. 3.60. Analysis gave SiO_2 32.93, ThO_2 1.64, Al_2O_3 14.51, Ce_2O_3 4.87, La_2O_3 &c. 8.19, FeO 15.23, MnO 4.32, CaO 12.61, MgO 0.74, CO_2 0.11, H_2O 4.58, UO_2 , SnO_2 traces, total 99.73.

	SiO_2	ZrO_2	UO_2	$(\text{Nb,Ta})_2\text{O}_5$	P_2O_5	Al_2O_3	Fe_2O_3	Rare- earths.	Ign	Total.
I.	32.40	58.71	1.06	trace	1.31	0.25	0.95	3.79	2.10	100.57
II.	12.49	19.84	1.92	0.44	23.87	0.48	0.23	37.37	2.35	99.34
III.	29.7	42.0	trace	2.7	—	2.8	2.3	13.1	5.5	100.1
IV.	25.7	40.9	—	—	7.6	2.0	0.6	17.7	3.5	100.0

Fergusonite from the pegmatite of Hagata, prov. Iyo, is developed as pyramidal or prismatic crystals with rough faces of the forms $cgsz$ [Dana's letters]; measured $ss' 79^\circ 10'$. The largest crystal is $5 \times 1\frac{1}{2}$ cm. Sp. gr. 5.30. Analysis gave: $(Nb,Ta)_2O_5$ 44.97, SiO_2 0.79, TiO_2 1.15, UO_2 3.18, SnO_2 0.35, Al_2O_3 1.35, Fe_2O_3 0.66, Y_2O_3 &c. 40.39, Nd_2O_3 &c. 0.89, CaO 1.40, MgO 0.58, CO_2 0.35, H_2O 3.92, total 99.98. Spectrum analysis showed the presence of several of the rare-earths, and in the tin precipitate of germanium. A greyish mineral resembling zircon occurs as small (1–5 mm.) crystals embedded in the biotite of the Hagata pegmatite. It shows the zircon forms $am p$; measured $pp' 56^\circ 41'$. Sp. gr. 4.4, $H. 7\frac{1}{2}$. Analysis III (also ThO_2 1.5, CaO 0.3, MgO 0.2) shows that it is a variety of zircon containing rare-earths, but differing from naegite [Abstr., vol. 2, p. 36] in containing less zirconia. As a new variety of zircon it is named hagatalite. Another variety of zircon, named oyamalite, occurs in the pegmatite of Oyama as green to brown radial aggregates resembling naegite; sp. gr. 4.1, $H. 7\frac{1}{2}$. This variety is distinguished by the presence of a considerable amount of phosphoric acid in addition to rare-earths; anal. IV (also ThO_2 0.6, CaO 0.6, MgO 0.8). L. J. S.

ZAMBONINI (F.), DE FIORE (O.), & CAROBBI (G.). *Su un sulfobismutito di piombo di Vulcano (Isole Eolie)*. Rend. Accad. Sci. Fis. Mat. Napoli, 1925, ser. 3, vol. 31, pp. 24–29; Annali del R. Osservatorio Vesuviano, 1925, ser. 3, vol. 1 (for 1924), pp. 31–36.

Aggregates of lead-grey, flattened acicular crystals about 2 mm. long were found in the deeper parts of fumaroles, with a temperature of 550 – 615° C., on Vulcano, Lipari Islands. Higher up in the same fumaroles the sublimations consist of sal-ammoniac, realgar, and sulphur. The crystals are probably orthorhombic and in the striated prism-zone show the forms $b(010)$, $m(110)$, and rarely $a(100)$, $n(210)$, $q(130)$. The angle $(010):(110) = 44^\circ 47'$ to $46^\circ 40'$ is near to that of bismuthinite and also several of the sulpho-salts. Sp. gr. 6.54, $H. > 2$. Analysis, Bi 66.00, Pb 15.79, Fe 0.51, Cu trace, S 17.70 (diff.), gives the formula $PbS. 2Bi_2S_3$. This new mineral is named *cannizzarite*. L. J. S.

BERMAN (Harry). *The identity of "lehnerite" and ludlamite*. Amer. Min., 1925, vol. 10, pp. 428–429.

Determinations made on a specimen labelled lehnerite from Hagendorf, Bavaria, gave: α 1.650, β 1.669, γ 1.689; sp. gr. 3.19, $H. 3\frac{1}{2}$. These data, together with those previously given for lehnerite [Abstr., vol. 2,

p. 417], are compared with those of ludlamite, and it is believed that 'lehnerite' is identical with ludlamite.

L. J. S.

ELSCHNER (Carl). *Ueber ein neues Guano-Mineral*. (Vorläufige Mittheilung.) *Kolloid-Zeits.*, 1925, vol. 37, p. 31.

A white plastic clay from a cave containing bat-guano in Mexico contained AlPO_4 14.52, Al_2O_3 2.40 %. This is considered to represent a colloidal form of aluminium phosphate. [Cf. meyersite, Abstr., vol. 2, p. 11.]

L. J. S.

ANTEN (Jean). *Le Salmien métamorphique du sud du massif de Stavelot*. Mém. (in-4°) Acad. Roy. Belgique, Cl. Sci., 1923, ser. 2, vol. 5, fasc. 3, 34 pp., 1 geol. map, 1 pl., 5 text-figs.

The stratigraphy and tectonics of the Salmien (Cambrian) rocks of this district in the Belgian Ardennes are described. The rocks described petrographically include quartzophyllades, red quartzites and whetstone phyllades with haematite and spessartine, and ottrelite-phyllades. A mineral named 'gosseletite' (p. 19) forms rounded green patches. It appears to be a manganese silicate and is pleochroic with high refraction and birefringence 0.100, optically positive with $2E > 120^\circ$, and prismatic cleavage; the characters suggesting orthorhombic symmetry. 'Lohestite' (p. 29) is the name given to an almost isotropic material occurring as knots and representing a stage in the formation of crystals of andalusite.

L. J. S.

Chemical Constitution of Silicates.

WINCHELL (A. N.). *The properties of scapolite*. Amer. Min., 1924, vol. 9, pp. 108-112, 1 fig.

Physical data, collected from the recent literature, are plotted against the chemical composition for the main series marialite ($\text{NaCl} \cdot 3\text{NaAlSi}_3\text{O}_8$) to meionite ($\text{CaCO}_3 \cdot 3\text{CaAl}_2\text{Si}_2\text{O}_8$). The density and the ordinary index of refraction fall along straight lines, but for the extraordinary index and the birefringence the lines are curved. The birefringence curve indicates that pure marialite would be optically positive, and that a crystal with the composition Ma_0Me_1 would be isotropic.

L. J. S.

WINCHELL (A. N.). *The FeSiO_3 — CaSiO_3 — MgSiO_3 — $\text{NaFeSi}_2\text{O}_6$ system of monoclinic amphiboles*. Amer. Min., 1925, vol. 10, pp. 335-341, 2 figs.

Further graphs are given plotting the optical constants against the chemical composition [Abstr., vol. 2, pp. 219, 304]. One shows the

series $\text{MgSiO}_3 - \text{FeSiO}_3$ (kupfferite to grünerite). Another shows the system $\text{FeSiO}_3 - \text{CaSiO}_3 - \text{MgSiO}_3 - \text{NaFeSi}_2\text{O}_6$ on two triangles placed base to base; this includes the alkali-amphiboles riebeckite, hastingsite, &c.

L. J. S.

WINCHELL (A. N.). *Studies in the mica group (abstract)*. Amer. Min., 1925, vol. 10, pp. 52-54.

— *Studies in the mica group—Part I*. Amer. Journ. Sci., 1925, ser. 5, vol. 9, pp. 309-327, 3 figs. — *Part II*. Ibid., pp. 415-430, 2 figs.

Isomorphism depends on the atomic volumes, rather than on the valency, of the elements that may stand proxy for (rather than replace) one another. F, Cl, OH may 'proxy' for O; K does not proxy for H, nor Ti for Si. The best available analyses of biotite are calculated to percentages of atoms (omitting O, H, F). The atomic percentages of Si range from 31.8 to 38.5 (i. e. $5/16 - 6/16$), Al 12.7-25 ($2/16 - 4/16$), Mg + Fe'' + Mn 16.5-36.8 ($3/16 - 6/16$) and K(+Na+Ba+Ca) is always near 12.5% ($2/16$). The series therefore ranges from $\text{H}_4\text{K}_2\text{Mg}_6\text{Al}_2\text{Si}_6\text{O}_{24}$ to $\text{H}_4\text{K}_2\text{Mg}_5\text{Al}_4\text{Si}_5\text{O}_{24}$. Here Ti and Fe''' proxy for Mg. The several analyses are plotted on a square diagram at the four corners of which are $\text{H}_4\text{K}_2\text{Mg}_6\text{Al}_2\text{Si}_6\text{O}_{24}$ (phlogopite), $\text{H}_4\text{K}_2\text{Mg}_5\text{Al}_4\text{Si}_5\text{O}_{24}$ (eastonite), and the corresponding iron compounds $\text{H}_4\text{K}_2\text{Fe}_6\text{Al}_2\text{Si}_6\text{O}_{24}$ (annite) and $\text{H}_4\text{K}_2\text{Fe}_5\text{Al}_4\text{Si}_5\text{O}_{24}$ (siderophyllite). The optical data (α , γ , and $\gamma - \alpha$) plotted on the same diagram show appreciable increases in these values only for the members richer in iron. Variations in the optic axial angle are perhaps more closely connected with the relative amounts of hydroxyl and fluorine. In the above formulae (omitting H and O) the fundamental unit has in all cases 16 atoms, and these micas are therefore referred to as the 'octophyllite' or biotite system. In another group of micas, the 'heptaphyllite' or muscovite-lepidolite system, there are 14 atoms in the fundamental unit. Here there are four end-members, muscovite $\text{H}_4\text{K}_2\text{Al}_6\text{Si}_6\text{O}_{24}$, polyolithionite $\text{H}_4\text{K}_2\text{Li}_6\text{Si}_6\text{O}_{18}$, phengite $\text{H}_4\text{K}_2\text{Al}_4\text{Si}_8\text{O}_{28}$, and protolithionite $\text{H}_4\text{K}_2\text{Fe}''_3\text{Al}_4\text{Si}_5\text{O}_{22}$, which are placed at the corners of a tetrahedron. The majority of the plotted analyses fall on or near two of the surfaces of the tetrahedron, and are representative of two three-component systems, muscovite-polyolithionite-protolithionite and muscovite-protolithionite-phengite, which are referred to as the muscovite and lepidolite systems respectively. Optical data (β , $\gamma - \alpha$, and $2V$) are represented on the tetrahedron by contour lines. The octophyllites and the heptaphyllites are the two main groups of micas between which there are no mixed crystals; the former are

usually dark-coloured and have the optic axial plane parallel to (010) with $\rho < v$, while the latter are usually light-coloured with the optic axial plane perpendicular to (010) and $\rho > v$.

L. J. S.

WINCHELL (A. N.). *A new theory of the composition of the zeolites.* Amer. Min., 1925, vol. 10, pp. 88-97, 1 fig. — *Part II.* Ibid., pp. 112-117, 1 fig. — *Part III.* Pp. 145-152, 2 figs. — *Part IV.* Pp. 166-174, 2 figs.

The formulae usually accepted for the zeolites are criticized, but the constant ratio $(Ca + Na_2 + K_2) : Al_2 = 1 : 1$ is retained. (1) The composition of thomsonite (pp. 90-97).—The published analyses of thomsonite are plotted on a square at the four corners of which are the lime and soda molecules $Ca_3Al_6Si_{10}O_{32} \cdot Aq$, $Na_6Al_6Si_{10}O_{32} \cdot Aq$, $Ca_5Al_{10}Si_6O_{32} \cdot Aq$, and $Na_{10}Al_{10}Si_6O_{32} \cdot Aq$, the varying ratios $Al_2O_3 : SiO_2$ and $CaO : Na_2O$ being shown along the two co-ordinates. The analyses fall along a curved line between the two points $Na_4Ca_8Al_{20}Si_{20}O_{80} \cdot 25H_2O$ and $Na_7Ca_5Al_{17}Si_{23}O_{80} \cdot 20H_2O$ (the water being as deduced by S. G. Gordon, Abstr., vol. 2, 528). These form an isomorphous series in which NaSi replaces CaAl, as in the feldspars. (2) The composition of natrolite, mesolite, scolecite, gismondite, and laumontite (pp. 112-117).—Selected analyses of these are plotted on a square at the four corners of which are the molecules $Ca_2Al_4Si_{12}O_{32} \cdot Aq$, $Na_4Al_4Si_{12}O_{32} \cdot Aq$, $Ca_4Al_8Si_8O_{32} \cdot Aq$, and $Na_8Al_8Si_8O_{32} \cdot Aq$. Those of natrolite, mesolite, and scolecite fall in close clusters around the points $Na_2Al_2Si_3O_{10} \cdot 2H_2O$, $Na_2Ca_2Al_6Si_3O_{30} \cdot 8H_2O$, and $CaAl_2Si_3O_{10} \cdot 3H_2O$ respectively, and they afford no evidence of forming mixed crystals. Analyses of gismondite fall along a line and represent isomorphous mixtures of $KCa_{10}Al_{21}Si_{19}O_{80} \cdot 40H_2O$ and $K_4Ca_7Al_{18}Si_{22}O_{80} \cdot 36H_2O$. 'Zeagonite' is discussed in this connexion. Analyses of laumontite also fall along a line between the points $Ca_7Al_{14}Si_{26}O_{80} \cdot 25H_2O$ and $Na_2Ca_5Al_{12}Si_{28}O_{80} \cdot 25H_2O$. In these cases there is again the replacement of NaSi by CaAl, rather than of Na_2 by Ca. (3) The composition of chabazite and related zeolites (pp. 145-149).—These are plotted on a square on which the variables are the $Al_2O_3 : SiO_2$ ratio and the $CaO : Na_2O$ ratio. Chabazite falls along a line between $Ca_7Al_{14}Si_{26}O_{80}$ and $Na_4Ca_3Al_{10}Si_{30}O_{80}$, and gmelinite falls near another line from $Na_8Ca_4Al_4Si_{26}O_{80}$ and $Na_{12}Al_{12}Si_{28}O_{80}$. Some 'abnormal' types grading to chabazite are accounted for by the replacement of Ca by Na_2 . Levyne is near $NaCa_4Al_9Si_{16}O_{50} \cdot 25H_2O$. (4) The composition of phillipsite and related zeolites (pp. 149-152).—These are plotted on a square with $Ca_2Al_4Si_{12}O_{32} \cdot Aq$, $Ca_4Al_8Si_8O_{32} \cdot Aq$,

$K_4Al_4Si_{12}O_{32} \cdot Aq$, and $K_8Al_8Si_8O_{32} \cdot Aq$ at the four corners. Phillipsite analyses fall along a line between $K_4Ca_7Al_{18}Si_{22}O_{80} \cdot 40H_2O$ and $K_6Ca_6Al_{16}Si_{24}O_{80} \cdot 30H_2O$. Stilbite analyses cluster around a point $Na_3Ca_7Al_{21}Si_9O_{160} \cdot 6H_2O$, and harmotome is near $KBa_5Al_{11}Si_{23}O_{80} \cdot 25H_2O$. (5) The composition of heulandite and related zeolites (pp. 166-170).—Heulandite is represented approximately by isomorphous mixtures of $NaCa_5Al_{11}Si_{29}O_{80} \cdot 25H_2O$ and $Na_2Ca_4Al_{10}Si_{30}O_{80} \cdot 25H_2O$. (6) Comparative study and summary (pp. 170-174).—The suggested formulae for the several zeolites are tabulated and represented on a diagram. 'The most striking feature of these formulas is their remarkable complexity.' The 'alkali number' (i.e. number of $Ca + Na$ atoms to 240 oxygen atoms) ranges from 15 for pitilolite to 48 for natrolite. L. J. S.

WHERRY (Edgar T.). *Pseudo-isomorphism as illustrated in thomsonite*. Amer. Min., 1925, vol. 10, pp. 342-344.

Compares the divergent views on the composition of thomsonite (preceding abstract; Abstr., vol. 2, pp. 302, 528). Thomsonite proper has the refractive indices α 1.525, β 1.530, γ 1.540 and the composition $NaCa_2Al_5Si_5O_{20} \cdot 6H_2O$; and faroelite has α 1.512, β 1.513, γ 1.518, and $Na_2Ca_2Al_6Si_7O_{28} \cdot 7H_2O$. Variations can be explained by the mechanical intermixture with natrolite or mesolite. Determination of the refractive indices of a large number of specimens labelled thomsonite afforded no optical evidence for the existence of an isomorphous series. L. J. S.

GOßNER (B.). *Die chemische Zusammensetzung in der Gehlenit-Melilithgruppe*. Chemie der Erde, 1925, vol. 2, pp. 103-113.

The isomorphous mixing of such complex molecules as suggested by A. F. Buddington [Abstr., vol. 2, p. 155] is regarded as improbable; and the author traces a connexion between the minerals of the gehlenite-melilite group and the monoclinic ('pseudo-tetragonal') pyroxenes. They are regarded as double compounds $CaO + \text{pyroxene}$ [Abstr., vol. 2, p. 422] of the form $CaO \cdot [SiO_3Ca \cdot SiO_3Mg]$, where SiO_3Mg is replaceable by Al_2O_3 , and Si_2O_6MgCa by Si_2O_6AlNa . Gehlenite is written $CaO \cdot [SiO_3Ca \cdot Al_2O_3]$ and melilite as $2CaO \cdot [Si_2O_6MgCa \cdot Si_2O_6AlNa]$. Åkermanite approaches $CaO \cdot [SiO_3Ca \cdot SiO_3Mg]$. L. J. S.

GOßNER (B.). *Die chemische Zusammensetzung von Crossit, Arfvedsonit, Aenigmatit, Rhoenit und von Babingtonit*. Zeits. Krist., 1925, vol. 61, pp. 538-544.

From published analyses of these minerals, formulae are deduced on

the same lines as those previously given by the author for the alkali-amphiboles. [Abstr., vol. 2, pp. 422-423.] L. J. S.

BOWEN (N. L.) & GREIG (J. W.). *The crystalline modifications of NaAlSiO_4* . Amer. Journ. Sci., 1925, ser. 5, vol. 10, pp. 204-212, 4 figs.

According to earlier observations (N. L. Bowen, 1912) the compound NaAlSiO_4 is stable below 1248°C . as a hexagonal form corresponding with nepheline, and above this temperature as a triclinic(?) form with lamellar twinning which has been called carnegieite. New observations, made directly under the heating microscope with carnegieite mounted in a medium of fused microcosmic salt between slips of silica-glass, show that the material becomes optically isotropic (and presumably cubic) at a dull red-heat. The reverse change takes place on cooling. Another inversion at a lower temperature is shown by an abrupt change in the birefringence of the twin-lamellae. Heating-curves show that these changes take place at about 658° and 226°C . respectively. These new observations throw some doubt on the existence of the carnegieite molecule in feldspars. L. J. S.

AGAFONOFF (V.) & VERNADSKY (W.). *Le produit de la déshydratation du kaolin*. Compt. Rend. Acad. Sci. Paris, 1924, vol. 178, pp. 1082-1084.

The conclusion of G. Tammann and W. Pape that kaolin on dehydration falls to a mixture of silica and alumina [Abstr., vol. 2, p. 429], is proved to be incorrect. Crystalline kaolin from Aïn Barbar, Constantine, Algeria, gave SiO_2 46.65, Al_2O_3 40.17, ign. 13.78 = 100.60; sp. gr. 2.58-2.59, n 1.555. After heating at 450 - 550°C . the material showed no appreciable change in its microscopical characters, and it remained homogeneous; sp. gr. 2.32-2.38, n 1.513. Comparative tests were made in heavy liquids and stains with a finely powdered mixture of silica and alumina. This kaolin anhydride, $\text{Al}_2\text{Si}_2\text{O}_7$, is soluble in acids.

L. J. S.

X-rays and Crystal-structure.

CANAC (François). *Procédés d'étude des cristaux par les rayons X*. Ann. Physique, 1921, n. sér., vol. 15, pp. 153-246, 5 pls., 23 text-figs.

A general account of the principles involved in the various methods, with mathematical treatment. L. J. S.

[VULF (G. V.) = WULFF (G.). Вульф (Г. В.) [-1925]. О природе спайности кристаллов. [*On the nature of cleavage of crystals.*] Журн. Русс. Физико-Хим. Общ., Физ. отд. [Journ. Russ. Physico-Chem. Soc., Physic. Sect.,] 1923, vol. 55, pp. 49-54, 4 figs.

A chemical theory of cleavage is developed from the atomic structure as given by X-ray methods. The cases considered are fluorite, calcite, blende, halite, and diamond. P. N. C.

WEISSENBERG (K.). *Zur Systematik und Theorie der Wachstums- und Deformationsstrukturen.* Zeits. Krist., 1925, vol. 61, pp. 58-74, 4 figs.

MARK (H.). *Über die Methode und die Ergebnisse der experimentellen Bestimmung von Wachstums- und Deformationsstrukturen.* Ibid., pp. 75-91, 14 figs.

The orientation of irregularly bounded crystals and the direction of planes of gliding of deformed crystals, as in metals, can be determined from the X-ray patterns. L. J. S.

WEISSENBERG (K.). *Der Aufbau der Kristalle. I. Mitteilung. Die Systematik der Symmetriegruppen von Punktlagen im Diskontinuum.* Zeits. Krist., 1925, vol. 62, pp. 13-51. *II. Mitteilung. Atomgruppen im Kristall und ihre physikalische Bedeutung,* pp. 52-102.

In the first of these two papers an exposition is given of the geometrical theory of crystal-structure with examples drawn from the structure of well-known chemical elements and salts. In the second is obtained a theory of the dynamical atomic group ('dynade') in a crystal, and tables are compiled from which may be obtained the atomic group for a given space-lattice. H. H.

OLSHAUSEN (Siegfried v.). *Strukturuntersuchungen nach der Debye-Scherrer-Methode.* Zeits. Krist., 1925, vol. 61, pp. 463-514, 1 fig.

This research arose out of the wish to compare the relative accuracy of the Hull and Küstner cameras for work with the Debye-Scherrer film. The conclusion is reached that Küstner's camera is sufficiently accurate for practical purposes, and that the extra cost and time involved in the use of Hull's camera are unjustified. In the course of the research structures were determined for aluminium, niobium (Nb-Al alloy), manganese, red phosphorus, arsenic, selenium, tellurium, NaCl, RbCl, KI, cinnabar, metacinnabarite, clausthalite (PbSe), gersdorffite (NiAsS), calcite, aragonite, and vaterite. Extensive tables are given to assist in the interpretation of the film in the analysis of crystals of the cubic, hexagonal, tetragonal, and trigonal systems. H. H.

MARK (H.) & WIGNER (E.). *Die Gitterstruktur des rhombischen Schwefels*. Zeits. physikal. Chem., 1924, vol. 111, pp. 398-414, 6 figs.

X-ray analysis of natural and artificial crystals of rhombic sulphur shows that the symmetry is holohedral with space-group V_h^{24} . The unit cell, of dimensions $a = 10.61$, $b = 12.87$, $c = 24.56$ Å., contains 128 atoms. L. J. S.

LINCK (G.) & JUNG (H.). *Röntgenographische Untersuchung des schwarzen (metallischen) Phosphors*. Zeits. anorg. allgem. Chem., 1925, vol. 147, pp. 288-292.

White phosphorus (sp. gr. 1.83) is cubic, and red phosphorus (sp. gr. 2.34) monoclinic. The black modification, with the appearance of graphite, has sp. gr. 2.699. Examined by the powder method with X-rays it shows a rhombohedral structure, similar to arsenic, antimony, and bismuth, with eight atoms in the unit cell of edge $a = 5.96$ Å. and angle $\alpha = 60^\circ 47'$. L. J. S.

NOETHLING (W.) & TOLKSDORF (S.). *Die Kristallstruktur des Hafniums*. Zeits. Krist., 1925, vol. 62, pp. 255-259.

Hull's structure for zirconium was verified. For hafnium a hexagonal structure was obtained, with a closest-packed arrangement of the atoms. The size of the cell is given by $a = 3.32$ and $c = 5.46$ Å. H. H.

BARTH (T.) & LUNDE (G.). *The effect of the lanthanide contraction on the cubic platinum metals*. Norsk Geol. Tidsskrift, 1925, vol. 8, pp. 220-223, 1 fig.

BARTH (Tom.) & LUNDE (Gulbrand). *Der Einfluss der Lanthanidenkontraktion auf die Gitterdimensionen der kubischen Platinmetalle*. Zeits. physikal. Chem., 1925, vol. 117, pp. 478-490, 3 figs.

In the series of elements, cerium [no. 58] to cassiopeium [no. 71 = lutecium] (the 'lanthanides' of V. M. Goldschmidt, 1925), the spacings of the lattice decrease with increasing atomic number. Within a vertical column of the periodic table the lattice spacings of the elements increase with the atomic number; but when two elements in the same vertical column lie on either side of the lanthanides this increase is more or less compensated by the 'lanthanide contraction'. To test this theory of V. M. Goldschmidt, the following new X-ray measurements were made of the cubic face-centred platinum metals: rhodium $a = 3.795$ Å., iridium 3.823, palladium 3.873, platinum 3.903. The difference of the spacing for the pairs Pd-Pt and Rh-Ir is much less than that of the pairs Ni-Pd and Co-Rh respectively. Fuller details are given in the second paper. L. J. S.

OTT (H.). *Die Gitterstruktur des Karborunds (SiC) I.* Zeits. Krist., 1925, vol. 61, pp. 515-531, 9 figs.

Laue photographs gave for the second modification of carborundum (SiC) a hexagonal translation-group with $a = 3.09$ and $c = 15.17$ Å. Six molecules lie in each fundamental cell. The co-ordinates of the carbon atoms are 0 0 0, $00\frac{3}{6}$, $\frac{1}{3}\frac{2}{3}\frac{1}{6}$, $\frac{1}{3}\frac{2}{3}\frac{5}{6}$, $\frac{2}{3}\frac{1}{3}\frac{2}{6}$, $\frac{2}{3}\frac{1}{3}\frac{4}{6}$, and by adding $\frac{1}{8}$ to the third co-ordinate in each case the co-ordinates of the silicon atoms are obtained.

H. H.

OTT (H.). *Das Gitter des Karborunds (SiC). II.* Zeits. Krist., 1925, vol. 62, pp. 201-217, 6 figs.

Carborundum occurs in trigonal, hexagonal, and amorphous modifications. The second is the more stable at ordinary temperatures and the trigonal modification usually shows signs of incipient transformation into the second. Laue diagrams gave complete information as to the structure of the trigonal modification. It has a hexagonal Bravais cell with $a = 3.09$ and $c = 37.9$ Å containing 15 molecules, the dimensions of the cell being respectively equal to and $2\frac{1}{2}$ times those of the second modification. The co-ordinates of the C atoms are 0 0 0, $00\frac{2}{15}$, $00\frac{6}{15}$, $00\frac{9}{15}$, $00\frac{13}{15}$, and these qualities increased by $-\frac{1}{3}\frac{1}{3}\frac{1}{3}$, and $\frac{1}{3}-\frac{1}{3}\frac{2}{3}$. If these co-ordinates are increased by $00\frac{1}{20}$, the co-ordinates of the Si atoms are obtained.

H. H.

WEVER (Franz). *Beiträge zur Kenntnis des Eisenkarbides.* Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung zu Düsseldorf, 1922, vol. 4, pp. 67-80, 16 figs.

The different forms of cementite, Fe_3C , in metallurgical products are shown by X-ray analysis to be identical. They are orthorhombic with $a = 4.481$, $b = 5.039$, $c = 6.708$, and four molecules in the unit cell. The non-magnetic form gave at 275°C . (above the temperature, 210° , of the magnetic transformation) $a = 4.52$, $b = 5.08$, $c = 6.77$. L. J. S.

MARK (H.) & POHLAND (E.). *Das Gitter des Ammoniaks.* Zeits. Krist., 1925, vol. 61, pp. 532-537, 2 figs.

Ammonia crystallizes in the regular system between -77° and -160°C . The unit cell is a cube with edge 5.19 Å. and contains four molecules. The space-group is probably T^h , possibly T^h . The Debye-Scherrer method was used.

H. H.

HOLGERSSON (Sven). *Die Struktur der Sulfide von Mg, Ca, Sr und Ba.* Zeits. Anorg. Chem., 1923, vol. 126, pp. 179-182.

X-ray analysis by the powdermethod shows that these sulphides are of the face-centred cubic (halite) type with four molecules in the unit

cell. The dimensions of the unit cell are: for MgS 5.078, CaS 5.600, SrS 5.866, BaS 5.346 Å.

L. J. S.

RAMSDELL (Lewis S.). *The crystal structure of some metallic sulfides.* Amer. Min., 1925, vol. 10, pp. 281-304, 1 fig.

The crystal-structure as deduced from X-ray powder photographs was used as a final test of isomorphism in certain groups of minerals. Galena and artificial clausthalite (PbSe) and altaite (PbTe) are of the rock-salt type with $a = 5.93, 6.14$, and 6.34 Å. respectively. The radii of the S, Se, and Te atoms are deduced as 1.04, 1.15, and 1.27 Å. respectively. Argentite (and acanthite) and hessite (Ag_2Te) are probably orthorhombic; the cubic form of argentite being explained as a paramorph after a high-temperature modification of Ag_2S . Sperrylite (PtAs_2 , $a = 5.94$ Å.) has the same structure as pyrite ($a = 5.38$, Bragg). Ullmannite (NiSbS , $a = 5.91$ Å.), gersdorffite (NiAsS , $a = 5.68$ Å.), and cobaltite (CoAsS , $a = 5.58$ Å.) have also the same structure, though lower symmetry due to the replacement of one S atom by Sb or As. Smaltite and chloanthite ($a = 5.96$ Å.) give a more complex diffraction pattern, but they seem to be isomorphous with pyrite. Cinnabar has $a = 4.15$, $c = 9.51$ Å. ($a:c = 1:2.29$), with one molecule in the unit cell. Covellite (CuS) shows a structure different from that of cinnabar.

L. J. S.

ALSEN (Nils). *Vorläufige Mitteilung über eine Untersuchung der Kristallstrukturen von FeS und NiS.* Geol. För. Förh. Stockholm, 1923, vol. 45, pp. 606-609.

— *Röntgenographische Untersuchung der Kristallstrukturen von Magnetkies, Breithauptit, Pentlandit, Millerit und verwandten Verbindungen.* Geol. För. Förh. Stockholm, 1925, vol. 47, pp. 19-72, 4 pls., 14 text-figs.

X-ray analysis of pyrrhotine, meteoric and terrestrial troilite, and artificial FeS gave a holohedral hexagonal structure of space-group D_{6h}^{14} with two molecules in the unit cell of dimensions a 3.43, c 5.79 Å., $c/a = 1.69$. Pyrrhotine is probably a solid solution of sulphur in FeS , in which S atoms take the place of Fe atoms without affecting the structure. Breithauptite (NiSb ; a 3.92, c 5.11 Å., c/a 1.31), niccolite (NiAs ; a 3.610, c 5.028 Å., c/a 1.393), artificial NiAs , CoS , $(\text{Fe}, \text{Ni})\text{S}$ (FeCo), S, FeSe , $\text{Fe}(\text{S}, \text{Se})$, and NiSe have also the same structure with intermediate axial ratios. A mixed crystal $(\text{Ni}, \text{Fe})\text{S}$ of this type when fused solidifies as pentlandite; and the hexagonal structure is again restored by igniting the pentlandite in hydrogen sulphide. Pentlandite is of the cubic space-group O_h^5 with a 10.00 and 32 molecules $(\text{Ni}, \text{Fe})\text{S}$

in the unit cell. Millerite has the space-group C_{3v}^5 , and the unit cell containing three molecules is an obtuse rhombohedron of edge 5.64 Å. and α 116.6° (a 9.60, c 3.15 Å., c/a 0.328). When heated in hydrogen sulphide, millerite changes into the hexagonal modification of NiS. An artificial nickel sulphide Ni_3S_2 with sp. gr. 5.85 is cubic with one molecule in the unit cell of edge a 4.08 Å. L. J. S.

ULRICH (F.) & ZACHARIASEN (W.). *Über die Kristallstruktur des α - und β -CdS, sowie des Wurtzits.* Zeits. Krist., 1925, vol. 62, pp. 260-273, 4 figs.

The authors found by the Debye-Scherrer method that the dimorphism of CdS is parallel to that of ZnS. α -CdS (greenockite) has the space-group C_{6v}^4 with $a = 4.142$, $c = 6.724$ Å.; the co-ordinates of the Cd atoms being $(\frac{2}{3} \frac{1}{3} 0)$, $(\frac{1}{3} \frac{2}{3} \frac{1}{3})$, and those of the S atoms being $(\frac{2}{3} \frac{1}{3} \frac{2}{3})$, $(\frac{1}{3} \frac{2}{3} \frac{1}{3})$. The analogous α -ZnS (wurtzite) has $a = 3.836$, $c = 6.277$ Å. β -CdS is of the zinc-blende type with $a = 5.820$ Å. H. H.

LUNDE (Gulbrand). *The crystal structure of thallos chloride and thallos bromide.* Norsk Geol. Tidsskrift, 1925, vol. 8, pp. 217-219.

— *Bemerkungen über die Kristallstruktur von Thalliumchlorür und Thalliumbromür.* Zeits. physikal. Chem., 1925, vol. 117, pp. 51-56.

Debye-Scherrer diagrams give for $TlCl$ $a = 3.837$ and for $TlBr$ $a = 3.968$ Å. The lattice is the body-centred cubic (caesium chloride type). L. J. S.

SMEDT (J. De) & KEESOM (W. H.). *Das Gitter des festen Kohlendioxyds.* Zeits. Krist., 1925, vol. 62, pp. 312-313.

Reasons are given for preferring the value 1.05(5) Å. of the distance between the C and O atoms in solid carbon dioxide obtained by the authors (1924; Abstr., vol. 2, p. 511) to the value 1.60 Å. given by H. Mark and E. Pohland (1925; Abstr., vol. 2, p. 505). H. H.

ZACHARIASEN (W. H.). *Über die Kristallstruktur von BeO.* Norsk Geol. Tidsskrift, 1925, vol. 8, pp. 189-200, 1 pl., 1 text-fig.

Beryllium oxide, prepared by heating beryllium carbonate at 410° and also fused at about 2,500° C., was found by the X-ray powder method to be hexagonal with space-group C_{6v}^4 . The unit cell, $a = 2.694$, $c = 4.393$ Å., contains two molecules. A cubic form of BeO could not be obtained. [Cf. bromellite, p. 5.] L. J. S.

LEVI (G. R.). *Il reticolo cristallino dell'ossido manganoso*. Gazzetta Chimica Italiana, 1924, vol. 54, pp. 704-708. [Abridged translation:] *Das Kristallgitter des Manganoxyds*. Zeits. Krist., 1925, vol. 61, pp. 557-559.

Artificial MnO and manganosite from Franklin, New Jersey, examined by the X-ray powder method showed the rock-salt type of structure with $a = 4.40 \text{ \AA}$. The density deduced from this value is 5.46, and that determined directly for the artificial product 5.432. MnO gives reflections from the plane (111), whilst MgO (with $a = 4.22 \text{ \AA}$) does not.

L. J. S.

ULRICH (Fr.). *Notiz über die Kristallstruktur der Korund-Hämatitgruppe*. Norsk Geol. Tidsskrift, 1925, vol. 8, pp. 115-122, 3 figs.

A Laue photograph through the basal plane of an artificial crystal of ruby, prepared by Frémy, shows trigonal symmetry with a striking resemblance to the picture through (111) of fluorite. From the number of structure-planes with high and odd indices, it is concluded that the unit is a face-centred rhombohedron (the primitive rhombohedron of crystallography) with edge 7.08 \AA , and containing eight molecules. Haematite is of the same type, but shows some other structure-planes and different intensities. $\beta\text{-Al}_2\text{O}_3$ is hexagonal and $\gamma\text{-Al}_2\text{O}_3$ is cubic.

L. J. S.

BRAGG (Sir William) & GIBBS (R. E.). *The structure of α and β quartz*. Proc. Roy. Soc. London, Ser. A, 1925, vol. 109, pp. 405-427, 16 figs.

The physical properties of trigonal α -quartz and hexagonal β -quartz (stable below and above 575° C . respectively) are quoted from the literature and their structure discussed. In the previous model (Bragg, 1913) the position of the oxygen atoms was not known. This is now determined from the X-ray rotation photograph of β -quartz (which is very similar to that of α -quartz). The oxygen atoms surround the silicon atoms tetrahedrally, and the spirals parallel to the principal axis are formed by alternate atoms of silicon and oxygen. The change from β -quartz to α -quartz is explained by a slight shift in the model, which also explains the different types of twinning of both α - and β -quartz.

L. J. S.

WYCKOFF (Ralph W. G.). *The crystal structure of the high temperature form of cristobalite (SiO_2)*. Amer. Journ. Sci., 1925, ser. 5, vol. 9, pp. 448-459, 2 figs. [Translation:] *Die Kristallstruktur von β -Cristobalit SiO_2 (bei hohen Temperaturen stabile Form)*. Zeits. Krist., 1925, vol. 62, pp. 189-200, 2 figs.

The structure of β -cristobalite was investigated by the powder method. A cubic cell of edge 7.12 \AA . at 290°C . was found, containing 8 molecules of SiO_2 , the density at that temperature being 2.20. The Si atoms have the same positions as in silicon (diamond type), and the oxygen atoms lie halfway between them, the closest distance Si-O being 1.541 \AA . H. H.

WYCKOFF (Ralph W. G.). *Orthorhombic space group criteria and their application to aragonite*. Amer. Journ. Sci., 1925, ser. 5, vol. 9, pp. 145-175, 5 figs. [Translation:] *Kriterien für rhombische Raumgruppen und ihre Anwendung auf Aragonit*. Zeits. Krist., 1925, vol. 61, pp. 425-451, 4 figs.

A detailed analysis is given of the X-ray reflections to be expected in each of the various space-groups of the orthorhombic system, with the warning that the appearance of a reflection is of more significance than its supposed absence. The table is applied to aragonite, which is found to belong to the space-group $2 D_2 - 16 (V_h^{16})$ on the supposition that the crystal is holohedral. The unit cell containing four molecules CaCO_3 has dimensions $a = 4.94$, $b = 7.94$, $c = 5.72 \text{ \AA}$. H. H.

WYCKOFF (Ralph W. G.) & MERWIN (Herbert E.). *The crystal structure of dolomite*. Amer. Journ. Sci., 1924, ser. 5, vol. 8, pp. 447-461, 7 figs.

X-ray examination by Laue and spectrum photographs show the lower symmetry of dolomite (space-group C_{2v}^{12} or C_2^{14}) and spacing on the cleavages $d_{(100)} = 5.778 \text{ \AA}$. The acute rhombohedral unit cell, containing one molecule $\text{CaCO}_3 \cdot \text{MgCO}_3$ or $\text{CaCO}_3 \cdot \text{FeCO}_3$, has edge $a = 6.02 \text{ \AA}$. and angle $\alpha = 47^\circ 7'$. A ferriferous dolomite (FeCO_3 17.1, MnCO_3 4.5 %) gave practically identical results. L. J. S.

NISHIKAWA (Shoji) & HUDINUKI (Kiyosi). *Structure of nitrates of lead, barium and strontium*. (An Abstract.) Tôkyô Sûgaku-Buturi-gakkwai Kizi (Proc. Tôkyô Math.-Physical Soc.), 1917, ser. 2, vol. 9, p. 197.

The X-ray spectrometer method shows that the crystals of these salts contain four molecules $\text{R}(\text{NO}_3)_2$ in the unit cell, the exact dimensions of which have not yet been made out. The space-group is T_h^6 . L. J. S.

NISHIKAWA (Shoji). *Crystal structure of a garnet.* (An Abstract.) Tôkyô Sûgaku-Buturiagakkwai Kizi (Proc. Tôkyô Math.-Physical Soc.), 1917, ser. 2, vol. 9, pp. 194-197, 1 fig.

A crystal (211) of reddish-brown garnet (sp. gr. 4.13) from Yamanowo, Japan, is almandine $\text{Fe}_3\text{Al}_2(\text{SiO}_4)_3$ with about one-third of the iron replaced by manganese. The spacing given by the X-ray spectrometer on (100) is 2.85 Å., and the unit cell containing one molecule has edge $a = 5.8$ [i. e. 5.7] Å. The space-group is O_h^{10} . L. J. S.

BARTH (Tom.). *Die Kristallstruktur von Perowskit und verwandten Verbindungen.* Norsk Geol. Tidsskrift, 1925, vol. 8, pp. 201-216, 6 figs.

X-ray analysis of perovskite (CaTiO_3), dysanallyte, and prepared sodium niobate (NaNbO_3) give for the edges of the pseudo-cube containing one molecule the values 3.795, 3.826, and 3.890 Å. respectively. Dysanallyte is therefore regarded as an intermediate isomorphous mixture. Expressed as an orthorhombic crystal the dimensions of the unit cell containing two molecules of perovskite are $a = 5.302$, $b = 5.366$, $c = 3.777$ Å., and the space-group V_h^4 or V_h^{19} . L. J. S.

RINNE (Friedrich). *Bemerkungen zur Röntgenographie des Skolezits und Metaskolezits.* Neues Jahrb. Min., 1923, Beilage-Band 48, pp. 240-249, 9 figs.

Laue diagrams showing numerous spots are given on the planes (100), (010), (001), ($Ok\bar{l}$), and ($h0l$) of scolecite. After heating to about 300° C. the (100) plate becomes the (010) of metascolecite, and (010) becomes (100); ($Ok\bar{l}$) and ($h0l$) are also interchanged. These Laue diagrams of metascolecite show some asterism, while that on (001) is much disturbed. Similar changes in some other minerals are discussed. L. J. S.

HOFFMANN (H.) & MARK (H.). *Das Gitter der Oxalsäure.* Zeits. physikal. Chem., 1924, vol. 111, pp. 321-356, 7 figs.

X-ray analysis of oxalic acid shows the crystals to be orthorhombic holohedral and of the space-group V_h^{15} . The unit cell, $a = 6.46$, $b = 7.79$, $c = 6.02$ Å., contains two molecules $\text{COOH} \cdot \text{COOH}$. A second modification of anhydrous oxalic acid has the form of needles which are probably monoclinic. Oxalic acid with water of crystallization is monoclinic holohedral and space-group C_{2h}^5 . The unit cell $a = 6.05$, $b = 3.57$, $c = 11.9$ Å., contains two molecules $\text{COOH} \cdot \text{COOH} \cdot 2\text{H}_2\text{O}$.

L. J. S.

MARK (H.) & POHLAND (E.). *Über die Gitterstruktur des Äthans und des Diborans*. Zeits. Krist., 1925, vol. 62, pp. 103–112, 2 figs.

The structure of ethane (C_2H_6) and boroethane (B_2H_6) was investigated by the Debye-Scherrer diagram. Their symmetry is hexagonal, and the number of molecules per unit cell is four. The dimensions of this cell in Ångström units are $a = 7.74$, $b = 4.46$, $c = 8.19$ for C_2H_6 , and $a = 7.89$, $b = 4.54$, $c = 8.69$ for B_2H_6 . H. H.

BROOMÉ (B.). *Über Laueaufnahmen von kristallisiertem Benzol*. Zeits. Krist., 1925, vol. 62, p. 325.

Orthorhombic symmetry with $a:b:c = 1:0.770:0.725$ was obtained from Laue photographs for solid benzol, agreeing with results obtained earlier by the powder method (B. Broomé, Physikal. Zeits., 1923, vol. 24, p. 124). H. H.

Topographical Mineralogy.

HEDDLE (M. Forster) [1828–1897]. *The mineralogy of Scotland*. Edited by J. G. GOODCHILD. Reprinted under authority of Alex. THOMS by the Council of University College, Dundee, assisted by D. E. I. INNES. St. Andrews (W. C. Henderson & Son), 1923, vol. 1, lviii + 148 pp., 51 + 5 pls., 30 text-figs.; vol. 2, viii + 250 pp., pls. 52–103 + 9. Price 15s.

A reprint with very few slight alterations of the two volumes published in 1901 [Min. Mag., vol. 13, p. 194]. In vol. 1 there is still the statement: 'Witherite has not yet been recorded from Scotland', but in the supplement to vol. 2 it is mentioned from Wanlockhead.

L. J. S.

SMYTHE (J. A.). *Minerals of the north country*. Graphite. The Vasculum, Newcastle-upon-Tyne, 1921, vol. 7, pp. 100–104. II.—*Fluorspar*. Ibid., 1921, vol. 8, pp. 19–24. III. *Barium minerals*. 1922, vol. 8, pp. 90–93, 113–116. *Galena*. 1923, vol. 9, pp. 89–93, 106–109. *Silicates*. 1924, vol. 10, pp. 66–69, 100–103.

A compilation from the literature, together with some new observations, is given of the occurrence of certain minerals in the north of England (Northumberland, Cumberland, Durham, Westmorland, and Yorkshire): The fluorite and galena deposits in the Lower Carboniferous rocks of the central area are perhaps connected with the intrusion of the Whin Sill. Around this area is a barytic fringe, containing less lead, extending upwards into the Coal Measures. The silicates mentioned

include anorthite, kaolinite, collyrite, and pectolite. New analyses of pectolite: I. filling vesicles in the Whin Sill at Caw Burn, north of Haltwhistle; II. from Caldron Snout, Teesdale.

	SiO ₂ .	Al ₂ O ₃ .	FeO.	MnO.	CaO.	MgO.	K ₂ O.	Na ₂ O.	H ₂ O.	Total.	Sp. gr.
I.	55.00	—	0.69	0.31	26.83	4.79	trace	6.20	5.96	99.78	2.761
II.	52.16	0.62	0.22	1.40	32.64	—	1.52	7.02	4.14	99.72	2.736

L. J. S.

CARSTENS (C. W.). *Mineralvorkommen im Trondhjemgebiet*. Norsk Geol. Tidsskrift, 1925, vol. 8, pp. 140-146.

The Trondhjem district is poor in mineral occurrences. Prochlorite from Dragset.—Analysis by N. Sahlbom of a chlorite-schist, after deducting 10.9 % apatite, sphene, and chalcopyrite, gave I for the chlorite mineral; sp. gr. 2.870. The greenish-black chlorite is optically uniaxial and positive. Epidote from Kvamskammen.—Green columnar epidote occurs in quartz-calcite veins traversing a gabbroid rock. It has $\gamma - \alpha$ 0.045, 2V about 75°, $c : \gamma = 3\frac{1}{2}^\circ$. Analysis by K. Bryn gave II (also TiO₂ 0.02), after deducting 6 % of quartz. Stilbite from Rove.—Red spherulitic aggregates were found in the crevices of the crystalline schists. Analysis III by S. Hassel.

	SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	MgO.	CaO.	Na ₂ O.	K ₂ O.	H ₂ O.
I.	26.97	24.24	0.28	19.79	0.29	18.63	nil	0.10	0.04	9.71
II.	37.66	21.78	14.03	0.39	—	—	24.12	—	—	2.00
III.	57.07	16.02	0.31	—	—	trace	7.63	0.71	0.32	17.55

L. J. S.

FLINK (Gust.). *Förteckning på Stockholms Högskolas samling av nya eller ofullständigt beskrivna mineral från Långban (fortsättning)*. Geol. För. Förh. Stockholm, 1923, vol. 45, pp. 441-444; 1924, vol. 46, pp. 704-709.

The list of new or undetermined minerals from Långban is increased to 315 [Abstr., vol. 2, p. 261].

TEGENGREN (F. R.). *Sveriges ädlare malmer och bergverk*. [Swedish noble ores and mines.] Sveriges Geol. Unders. Avhand, och Uppsater i 4°, 1924, ser. C a, no. 17, viii + 406 pp., 32 pls., 91 text-figs. Price 15 kr.

Gives a detailed account of the geology and history of mining in each of the mining districts of Sweden. The ores of all metals except iron are

included. Statistics of production date from 1506. Indexes of localities are arranged alphabetically and under each metal. The volume is illustrated with maps and plans of mines. L. J. S.

ORCEL (J.). *Notes minéralogiques et pétrographiques sur la Corse*. Bull. Soc. Sci. Hist. Nat. Corse, 1924, nos. 461-464, pp. 65-127, 14 pls., 11 text-figs.

The granitic region to the west and south-west of Corsica consists of granites, gabbros, alkali-granites with riebeckite and aegirine, micro-granites, &c. The schistose region of the north-east consists of serpentines, glaucophane-schists, glaucophanites, &c. Material published by the author in earlier papers is here collected together. [Abstr., vol. 1, p. 276; vol. 2, pp. 48, 184.] L. J. S.

PELLOUX (Alberto). *Minerali della regione marmifera Carrarese*. Mem. Soc. Lunigianese G. Capellini, Spezia, 1920, vol. 1, fasc. 3-4 (reprint, Sarzana, 8 pp.).

A list, with brief descriptions and localities, is given of 36 mineral-species that have been recorded from the marble district of Carrara, Tuscany. A bibliography of 40 items is added. L. J. S.

BILLOWS (E.). *Studi cristallografici di minerali Sardi*. (Serie Ia.) Atti Accad. Veneto-Trentino-Istria, Padova, 1924, ser. 3, vol. 14 (for 1923), reprint 20 pp., 12 figs.

— *Studi cristallografici di minerali Sardi*. (Serie II.) Cagliari (G. Ledda), 1925, 10 pp.

Anglesite from Monteponi, Sardinia, gave, on three measured crystals, the forms: $abcm\lambda\kappa d l o z y v$ [Dana's letters], (101), (223), (255), and the new forms (32.33.0), (203), (209), (6.0.23), (12.0.50), (548), (883), (2.5.25). Three crystals of sulphur occurring with anglesite in galena from Monteponi gave: $abcmen\theta p y s o t$, and new (10.0.61), (021), (045), (053), (0.92.1). Cerussite from San Giovanni, Iglesias, gave: $abcmrykRuipg$, and new (230), (270), (190), (28.1.0), (750), (7.15.0), (7.17.0), (7.19.0), (4.13.0), (1.17.0), (1.25.0), (0.250.1), (0.50.1), (0.25.11), (0.9.19). Chessylite from Campo Pisano, Iglesias, gave: $abc\sigma\theta v\psi D f p l m w s x h k Q \gamma a$, and new (441). Crystals of blende and pyromorphite are also described. Natrolite as tufts of colourless needles occurs in a chalybite vein with quartz and galena in the Nieddoris mine, Fluminimaggiore.

The second note describes crystals of the following Sardinian minerals. Millerite, with galena, blende, and chalybite from Gonnosfanadiga, as

tufts of needles showing the prism-faces *mak* [Dana's letters], (7290), and new (13.2.15.0). Cuprite from Calabona. Heulandite, analcime (n 1.486), and mesolite in andesite from Montresta. The natrolite from the Nieddorris mine (see above) shows the forms (110), (111). Pyromorphite from Monte Crabulatzu.

L. J. S.

HIBSCH (J. E.). *Erläuterungen zur geologischen Karte der Umgebung von Bilin*. [Czech résumé:] *Vysvětlivky ku geologické mapě okolí Bilyny*. Knihovna Státního Geol. Ústavu Československé Republiky, 1924, vol. 8, 148 pp., 1 geol. map, 1 pl., 16 text-figs. (pp. 1-131, Germ.; pp. 133-134, Czech).

The geological map of the neighbourhood of Bilin (Bilina) in the Midland Mountains of Bohemia shows small patches of gneiss overlain by Upper Cretaceous and Tertiary sediments and by Tertiary volcanic rocks. The latter include felspar-, nepheline-, leucite-, and glassy basalts, sodalite-tephrite, phonolite, and phonolite-tuffs. The few minerals described include aragonite sinter [Abstr., vol. 2, p. 475], anauxite and cimolite pseudomorphous after augite [Abstr., vol. 2, p. 306], bilinite, duxite, &c. The well-known crystals of 'Bilin' aragonite really come from the Spitzberg near Horschenz on the adjoining Sheet 14 of the map [Abstr., vol. 2, p. 117].

L. J. S.

[BELSKY (S. V.) and others] БЕЛЬСКИЙ (С. В.) . . . К геологии Волинии. [*To the geology of Volhynia*.] Труды Волинской Геол. Партии, Исследования 1923 года. Житомир, 1925. [Trans. Volhynian Geol. Party, Investigations in 1923. Zhitomir, 1925.] pp. 1-145, 1 pl., 3 maps.

In 1923 work was done in two districts: the Zhitomir and Shepetovsky district, and in the neighbourhood of the town Korosten. The rocks here are almost exclusively granites, pegmatites, and granite-gneisses. Quartz-dioritic, banatitic, adamellitic, biotite-granitic, and other types are distinguished. Economic minerals (pp. 43-108, 112-121) include felspar, muscovite, quartz, iron-ores, clays, white quartz-sand, and peat. The minerals are described by L. L. Ivanov (pp. 125-145). Crystals of microcline (to 15 × 12 cm.) and orthoclase are figured. Other felspars include moonstone, labradorite, and perthite. Topaz, first found in 1911 as cleavage-flakes in soil, has now been found in situ in pegmatite. It is colourless with sp. gr. 3.59, α 1.615, β 1.620, $2V$ $64\frac{1}{2}^\circ$. Other minerals mentioned include orthite, zircon, almandine (crystals to 8 cm.), amethyst, tourmaline, fluorite, &c.

P. N. C.

MOROZEWICZ (Józef). *Komandory. Studium geograficzno-przyrodnicze.—The Commander Islands. A study (geography and natural history).* Warszawa (Instytut Popierania Nauki.), 1925, xiv + 230 pp., 2 geol. maps, 36 pls., 8 text-figs.

A general account, based on the results of the 1903 expedition of the Russian Geological Survey, is given of Bering Island and Copper (Miedziana) Island in Bering Sea. Petrographical descriptions and analyses are given of the rocks, which include soda-rhyolite, alaskite, trachydolerite, andesites, beringite, augitite, and Oligocene tuffs. The chapter (pp. 197–224) on the mineralogy of the Commander Islands describes the rock-forming minerals (felspar, pyroxene, and amphibole), copper-ores, zeolites (analcime, stellerite, ptilolite, stilbite, chabazite, laumontite, and natrolite). L. J. S.

KITSON (A. E.). *Outline of the mineral resources of the Gold Coast, with hints on prospecting.* [Geol. Survey Gold Coast, London, 1925], 20 pp.

Minerals of proved economic importance include: gold, manganese, bauxite, diamond, iron, &c. Brief notes are given on the geology of various districts. L. J. S.

MAUFE (H. B.). *Report of the Director for the year 1924.* Southern Rhodesia, Geological Survey, 1925, pp. 11.

Contains brief notes on various mineral occurrences in Southern Rhodesia. Alunogen and copiapite have been found in the Lomagundi district, but no details are available. Corundum occurs (and is now worked) at Rusape in mica-schist which is cut by granite and pegmatite; it is held to have been formed by contact-metamorphism. S. J. S.

BUTTGENBACH (H.). *Minéralogie du Congo belge.* Mém. Soc. R. Sci. Liège, 1925, ser. 3, vol. 13, no. —, 183 pp., 1 map, 86 figs.

This is an extension of a previous paper [Abstr., vol. 2, p. 265] collecting together all the information respecting each mineral species (118 in number) known from the Belgian Congo. The species are grouped under the headings: copper, cobalt, uranium (and radium), precious metals, iron, lead and zinc, tin, diamond, fuels and hydrocarbons, miscellaneous minerals. Historical notes are given with each of these sections. There is a map (100 km. = 2.1 cm.), index of localities, and bibliography of 70 papers. Many new observations are included. L. J. S.

BUTTGENBACH (H.). *Liste des espèces minérales et de leurs formes cristallines trouvées en Belgique et au Congo belge*. Livre Jubilaire Soc. Géol. Belgique, Liège, 1925, reprint 37 pp. (4°).

The species are listed in the order of Dana, and for each are given the localities where found in Belgium and Belgian Congo, together with a brief statement of the modes of occurrence. For those found as crystals the axial ratios and the crystal-forms that have been observed are stated. The forms are given only in the Lévy notation. Separate lists of Belgian and Congo minerals would have been more generally useful. L. J. S.

BUTTGENBACH (H.). *Les minéraux de Sidi Amor Ben Salem (Tunisie)*. Livre Jubilaire, Soc. Géol. Belgique, Liège, 1925, reprint 8 pp., 10 figs.

Further notes are given on the minerals from Sidi-Amor or the Sidi-Amor-ben-Salem mine [Abstr., vol. 1, pp. 176, 201]. Phosgenite crystals (3 cm. long) with a tinge of brown show the forms *c a m h o x s* [Dana] also (101) and (401). On the prism faces the hardness is less in the vertical direction than across. Analysis by Mélon gave PbO 80·84, CO₂ 9·16, Cl 13·08 = 103·08; sp. gr. 6·12. Some further forms are noted on clear crystals of anglesite. Rounded grains of galena embedded in limestone show the cleavage in intercrossing sectors, each grain consisting of an interpenetrant twin on (111). L. J. S.

EAKLE (Arthur S.). *Minerals of California*. Bull. Calif. State Mining Bureau, 1923, no. 91, 328 pp.

This is a new edition of Bulletin no. 67 (1914), and is written on the same lines by the same author. It shows an increase of a hundred pages, and the number of mineral-species known from California is increased from 325 to 381, whilst many more localities are added for each species. There is an index of counties, but a more detailed locality index would be useful. A bibliography is added. L. J. S.

CODAZZI (Ricardo Lleras). *Catalogo descriptivo de los minerales de Muzo*. Biblioteca del Museo Nacional, Bogota, 1925, 25 pp.

An account is given of the emerald mines of Muzo and of the minerals found there. Mention is made of other occurrences of emerald in Colombia. Brief descriptions are given of 134 specimens from Muzo in the National Museum at Bogota. [Cf. Abstr., vol. 1, p. 334.]

L. J. S.

Rock-forming Minerals and Petrology.

The physical chemistry of igneous rock formation. Trans. Faraday Soc., 1925, vol. 20, pp. 413-501. As a separate: London (Gurney & Jackson), 1925, pp. 413-501+4 pp. Price 6s. 6d. (to members 4s. 6d.).

This series of papers was presented for general discussion at a joint meeting of the Faraday, Geological, and Mineralogical Societies held in London on October 22, 1924. The discussion and contributed remarks are printed in full.

FLETT (J. S.), in his introductory remarks (pp. 414-417), reviewed the development of research on rock-melts. Early syntheses by Sir James Hall, Ebelmen, Senarmont, and others proved the origin of common rock-forming minerals from fusion. Toward the close of the nineteenth century Fouqué and Lévy and Morozewicz successfully applied the petrological microscope to the study of artificial melts. With the development of modern research methods, guided by the phase rule, and aided by new appliances for high temperature work, there has resulted a substantial extension of this field of research by workers such as Doelter, Vogt, and Tammann. Finally, the systematic investigations by the Geophysical Laboratory in Washington supply an ever-increasing volume of accurate data for the fused silicates.

TYRRELL (G. W.). *Review of recent work on the origin and differentiation of igneous rocks* (pp. 418-427).—Bowen's 'reaction-principle' and 'reaction-series' are described, with his work on crystallization-differentiation and V. M. Goldschmidt's elaboration of the reaction-series. Other authors have also made use of the idea of differentiation by crystal-sinking, and Vogt's recent discussion of this subject is outlined. Attention is directed to the views of Goodchild on the rôle of mineralizers. Reference is made to various theories advanced to explain anorthosites and similar rocks. On the origin of alkali-rocks the views of Daly, Bowen, Evans, and Shand are noted, with the work of Bowen and Scheumann on alnöites.

NIGGLI (Paul). *Homogeneous equilibria in magmatic melts and their bearing on the processes of igneous rock-formation* (pp. 428-441, 1 fig.).—A complete description of the phenomena of crystallization in rock-melts by means of equilibrium diagrams would still leave unexplained the laws which govern the peculiar form of the equilibrium surfaces. To arrive at these laws it is necessary to study the internal equilibrium of the fused material and to decipher the molecular chemistry of magmatic

solutions. There has of late been a general tendency to over-emphasize the study of heterogeneous equilibria and to neglect the study of the internal (molecular) condition of the melt. The latter may be investigated either by direct experiment, by considering magmatic differentiation, or by deduction from the nature of the solid phases in equilibrium with the melt (heterogeneous equilibria). The last method is developed in some detail, the form of the stability-surfaces being considered qualitatively as evidence for the probable degree of dissociation in the respective melts. A variety of possible reversible reactions (molecular equilibria) are tabulated. Consideration of the mineral composition of the principal rock-types leads to the observation that the Pacific type yields only minerals of simple composition, like quartz, olivine, spinel; it is therefore suggested that the corresponding melts were principally composed of those compounds, and the appropriate reversible reactions are formulated. For the Mediterranean type the minerals are more complicated, but similar equilibria are formulated for minerals like melanite. The origin of the Atlantic type is discussed in relation to possible desilicification by calcium carbonate. For these melts the molecular constitution is regarded as being the most complicated, and it is suggested that heteromorphism is of frequent occurrence. In conclusion, the foregoing varied equilibria are summarized in a diagram, and it is suggested that they are the controlling factor in the differentiation of the respective types.

RICHARDSON (W. Alfred). *Some ultimate problems in petrogenesis* (pp. 442-445).—Statistics prove that the igneous rocks belong to two main types, alkali-granite and olivine-basalt. This accords with the work of Daly on outcrop areas, of Richardson on silica-percentages, and of the geodetic surveys, which show that the material below the continents is lighter than that below the oceans, and also with the frequency-relations of topographic heights, which indicate the existence of two primitive levels. The bearing of these general results on petrographic research is discussed in relation to the processes of intrusion, and several lines of research are suggested.

GREGORY (J. W.). *Magmatic ores* (pp. 449-458).—The extent assigned to this class of ores is largely bound up with the definition of the term 'magmatic', which has been unduly extended by some authors to include even hydrothermal and solfataric deposits. A series of representative ores of this class is examined and the conclusion is reached that they are rarely formed by direct deposition from magmas. Typical iron ores, nickel-sulphide ores, and the great pyritic masses were all deposited from solutions, though the waters were probably of magmatic

origin. The distinction is of great practical importance for the extent of the ore-bodies.

EVANS (J. W.). *Proposed researches on the chemistry and physics of igneous magmas and rocks* (pp. 463-467).—Stress is laid on the influence of mineralizers, and the conditions of consolidation of igneous rocks are outlined. A very complete summary of the possible methods of research is then given, both for uniform pressure and for shears.

DESCH (C. H.). *The theory of crystallisation in rock magmas* (pp. 469-473, 1 fig.).—The freezing of metals and of silicates is contrasted. Reference is made to the work of Miers on the crystallization of salol and betol, and the view is expressed that the rarity of eutectic structures in igneous rocks is due to under-cooling. Bowen's use of the idea of 'reaction-series' is adversely criticized, and a comparison is made between micropegmatite and a copper-antimony alloy, with the conclusion that they are both eutectic structures. The equilibrium diagram should not be replaced by a new principle; the difficulties of the petrologist are due to a single new factor, namely, a high degree of molecular association.

TURNER (W. E. S.). *Some physical properties of silicate glasses and their possible bearing on the history of igneous rocks* (pp. 481-488).—Density, thermal expansion, and compressibility are additive properties. Many glasses contain dissolved gas, which comes off in two stages, at 200-300° C. and at 400-600° C.; more can be extracted again from the fused glass. Gas absorbed at a lower temperature is expelled in a 're-boil' when the melt is further heated. The permanent gases are not greatly soluble in molten glass at atmospheric pressure. Diffusion in fused glass is extremely slow. The relation of viscosity to composition is discussed in the light of measurements made in the author's laboratory. Weathering and corrosion are mainly due to water, and the rate of corrosion is related to the rate of water absorption. Hydration gives rise to frosting, especially when the glass is heated. Details are given of the effect of composition on corrosion.

HALLIMOND (A. F.). *The formation of eutectic and similar structures in silicate melts* (pp. 489-493).—A classification based on micro-structure is more widely applicable than one based on chemical composition. The extent of the stability-fields for the respective minerals can be investigated without a knowledge of the melting-points, by consideration of the order of crystallization. A method of classification for the silicate melts which depends on the order of crystallization is described and illustrated. Graphic structure only appears in melts which have undergone relatively

rapid cooling; the mechanism of formation of graphic intergrowths is discussed in detail, with examples from steels and slags. These structures do not imply any great degree of super-cooling. Ophitic structure arises from a different cause, and the transition from one type to the other is sharply defined. Attention is drawn to the value of examining polished plane surfaces in reflected light.

SCOTT (Alexander). *Physical chemistry and igneous rock formation* (pp. 494-499).—Methods of research at the Geophysical Laboratory in Washington are summarized. The question of immiscibility in silicate melts has been much debated. Practically nothing is known of the chemical equilibrium within the melt, and at present deductions can only be made from the nature of the solid phases. There is a lack of information on the formation of minerals below about $1200^{\circ}\text{C}.$, and it is at these temperatures that natural melts crystallize. Reference is made to Bowen's reaction-series, with special regard to the relations of pyroxenes to amphiboles and the effect of alteration in conditions during cooling. The term 'eutectic' is restricted to two-component systems, and is regarded as inapplicable in the case of two minerals that crystallize together over a temperature-range. The main difficulties in interpreting igneous rocks arise from the presence of water, which modifies the later stages of crystallization, for example, in essexites. Pressure has been little studied and there is a wide field open for research. A. F. H.

ALLING (Harold L.). *The mineralogy of the feldspars. Part I.* Journ. Geol., 1921, vol. 29, pp. 193-294, 6 pls., 19 text-figs.
Part II. Ibid., 1923, vol. 31, pp. 282-305, 353-375, 2 pls., 7 text-figs.

All feldspars, with the exception of those containing celsian or carnegieite molecules, must in general be considered as members of the three-component system $\text{KAlSi}_3\text{O}_8 - \text{NaAlSi}_3\text{O}_8 - \text{CaAl}_2\text{Si}_2\text{O}_8$. Two series of these solid solutions are possible according as the potash component is present as orthoclase (monoclinic) or microcline (anorthic), and certain physical properties, viz. extinction-angles, specific gravity, and refractive index, are plotted on the two respective triangular diagrams. The twinning seen in sections of microcline may often in part be due to the grinding of the section. A curve is drawn to illustrate the average compositions of the naturally-occurring series, and from this the probable amount of lime in anorthoclase and of potash in plagioclase may be assessed to the composition deduced from microscopic determinations; several examples with figures are given. The various single-component and two-

component systems are discussed separately, and the potash-lime feldspars, which occur only as intergrowths, are mnemonically called oranite. The various thermal diagrams for the albite-orthoclase series of Vogt and Warren, Dittler, Mäkinen, and Marc apply under different pressures, and a solid diagram is suggested to show this variation. X-ray investigations by the Japanese workers also throw light on the relations of anorthoclase to perthite. A classification of feldspars based on the decimal principle of Calkins is suggested. E. D. M.

DUPARC (Louis) & REINHARD (Max). *Les méthodes de Fédorof et leur application à la détermination des plagioclases.* Schweiz. Min. Petr. Mitt., 1923, vol. 3, pp. 1-74, 1 pl., 25 text-figs.

This is an excellent description of the principles and application of the universal stage, whether adaptable or fixed, and may well serve as an introduction for the novice. Examples are given of the three ways of plotting results, viz. the Nikitin hemisphere and the Fedorov and the Wulff nets, the last being advocated for general use. The determination of a plagioclase feldspar is made from the usual measurements by deducing the co-ordinates of the twin-plane, twin-axis, and cleavage-plane with reference to the principal vibration-axes of one individual. A stereogram has been prepared from data including unpublished material by Becke to illustrate the migration of these crystallographic elements throughout the series. The optic axes may also be used in a similar way. Four examples of different types of twin are worked out and several detailed improvements of technique suggested. E. D. M.

DUPARC (L.) & REINHARD (M.). *La détermination des plagioclases dans les coupes minces.* Mém. Soc. Phys. Hist. Nat. Genève, 1924, vol. 40, pp. 1-149, 13 pls., 69 text-figs.

This is essentially a compilation and includes some of the most recent work, especially of the Swiss workers. The different methods are classified under the headings of those of Fouqué and Michel Lévy, Fedorov, Becke, and the determination of refractive index and birefringence. Appended to each of these chapters is given a comprehensive bibliography. In connexion with the Fedorov method three projections perpendicular to the crystallographic axes respectively (pls. 11-13) show the migration of the optic axes and vibration-axes for the series. The authors assert that direct comparison of results with one of these projections, according to the type of twin, gives the best results. E. D. M.

BEREK (M.). *Zwillings-Fehlbildungen an Plagioklasen und ihre Bedeutung für die Anwendung der Ussowschen Diagramme*. Zeits. Krist., 1925, vol. 61, pp. 177-178.

The Fedorov-Ussov optical method for determining the twin-plane and the percentage of anorthite in plagioclases is based on the assumption that the two portions of the twin are identical. Sometimes, however, the optic axial angle may differ by as much as 10° in the two portions, with differences also in the three principal birefringences; or at times one portion may be optically positive and the other optically negative. These differences suggest that the two portions of the twin differ also in chemical composition. Such faulty twins may lead to error if the optical characters are not separately determined for each portion. L. J. S.

KRATZERT (J.). *Beitrag zur Kenntnis des Andesins von Bodenmais*. Sitzungsber. Heidelberg. Akad. Wiss., Math.-naturw. Kl., Abt. A, 1923, Abh. 5, 11 pp., 1 fig.

Selected colourless to pale green fragments of felspar from Bodenmais, Bavaria, have sp. gr. 2.663-2.668, cleavage-angle $bc = 86^\circ 12\frac{1}{2}'$, trace of rhombic section on (010) $2^\circ 45'$ to (001); extinction on (001) $-0^\circ 21'$, on (010) $-0^\circ 35'$. These characters correspond with *An* 32 %, agreeing with an acid andesine. Analysis, SiO_2 59.84, Al_2O_3 24.95, Fe_2O_3 0.67, FeO 0.51, CaO 6.16, Na_2O 7.43, K_2O 0.81, H_2O 0.44 = 100.81, gives *Ab* 64.88, *An* 29.80, *Or* 4.56, with a very small excess of silica and alumina. There is no evidence of the presence of the carnegieite molecule. L. J. S.

VENDL (Miklós). *Adatok a bazaltos amfibolok kémiai és optikai viszonyaihoz*. [Summary:] VENDL (Nikolaus). *Daten zur Kenntnis der chemischen und optischen Verhältnisse der basaltischen Hornblende*. Math. Természettud. Értesítő, Budapest, 1925, vol. 41, pp. 199-204 (Hung.), p. 205 (Germ.).

Translation of a paper published in Min. Mag., 1924, vol. 20, pp. 237-240. K. Z.

MAURITZ (Béla), VENDL (Miklós), & HARWOOD (H. F.). *A ditrói szienit további petrokémiai vizsgálata*. [Summary:] MAURITZ (B.), VENDL (N.), & HARWOOD (H. F.). *Weitere petrochemische Untersuchungen des Syenites von Ditró in Siebenbürgen*. Math. Természettud. Értesítő, Budapest, 1925, vol. 41, pp. 61-73 (Hung.), p. 74 (Germ.).

Detailed petrographical descriptions, with chemical analysis by H. F. Harwood, are given of five rock types, new for the syenite massif of Ditró in Transylvania, namely: aegirine-nepheline-cancrinite-syenite, essexite-theralite, camptonite, tinguaitite, and hornblendite-peridotite. K. Z.

MAURITZ (Béla). *A magmatikus differenciáció a ditrói és a mecseki foyaitos kőzetekben.* [Summary:] *Die magmatische Differentiation in den foyaitischen Gesteinen von Ditró und des Mecsekgebirges.* Math. Természettud. Értesítő, Budapest, 1925, vol. 41, pp. 241–251 (Hung.), p. 252 (Germ.), 2 figs.

MAURITZ (B.), mit chemischen Analysen von H. F. HARWOOD. *Die magmatische Differentiation in den foyaitischen Gesteinen des Ditró- und Mecsekgebirges.* Tschermaks Min. Petr. Mitt., 1925, vol. 38, pp. 195–205, 2 figs.

Chemical analyses, together with Osann's factors and Niggli's values, of rocks from the Ditró Mts. (Com. Csik, Transylvania) and from Mecsek Mts. (Com. Baranya) are tabulated and compared, and differentiation diagrams are given. In the Mecsek Mts. the most acid types are phonolites and the most basic limburgitoid trachydolerites. In the Ditró Mts. the differentiation is more advanced—from soda-alaskites to hornblendites.

K. Z.

VENDL (Aladár). *Az Alter-Pedrosoi riebeckit.* [Summary:] *Der Riebeckit von Alter Pedroso.* Math. Természettud. Értesítő, Budapest, 1925, vol. 41, pp. 206–213 (Hung.), p. 214 (Germ.). [See Abstr. vol. 2, p. 401.]

SCHALLER (Waldemar T.). *The genesis of lithium pegmatites.* Amer. Journ. Sci., 1925, ser. 5, vol. 10, pp. 269–279, 1 fig.

A study of the pegmatite veins worked for lithium minerals (lepidolite, spodumene, amblygonite, and gem-tourmalines) in southern California leads to the conclusion that these rocks are not the result of original crystallization of a magma rich in the so-called mineralizers, but that they are the result of later replacements (probably hydrothermal). The microcline and some of the quartz of the original graphic granite have been replaced first by albite and later by garnet and black tourmaline, while still later the lithium-bearing minerals have replaced all the previously formed minerals. Similar changes have perhaps taken place in the lithium-bearing pegmatites of other regions.

L. J. S.

Hess (Frank L.). *The natural history of pegmatites. A study to discover their mode of origin and to explain the various phenomena displayed.* Engineering & Mining Journal-Press, New York, 1925, vol. 120, pp. 289–298, 17 figs.

A general account of pegmatite veins or dikes, emphasizing the large size of the crystal-individuals and the large crystal-lined vugs found in

them. They show various mineral replacements, and may grade into quartz veins. The various phenomena can be explained only by a long continued flow of magmatic solutions.

L. J. S.

READ (H. H.). *A diopside bearing pegmatite near Ellon in Aberdeenshire*. Trans. Edinburgh Geol. Soc., 1925, vol. 11, pp. 353-356.

Pegmatite veins up to one foot across occur in limestone bands in the schists at Michaelmuir near Ellon. A coarse biotite-pegmatite grades into a finer grained diopside-pegmatite containing also sphene, orthoclase, and quartz. The adjoining limestone has been altered to a diopside-skarn. There has thus been a reciprocal reaction, the pegmatite being enriched in lime and the limestone in silica. Near these pegmatites are fissure veins containing orthoclase and wollastonite.

L. J. S.

GUPPY (Eileen Mary) & HAWKES (Leonard). *A composite dyke from eastern Iceland*. Quart. Journ. Geol. Soc. London, 1925, vol. 81, pp. 325-343, 2 pls., 3 text-figs.

A composite dike at Hökulvíkurgil shows unusual features which indicate that the acid magma shattered and penetrated a previous dolerite intrusion. The dolerite contains resorbed xenocrysts of quartz and soda-orthoclase similar to the phenocrysts of the quartz-porphyry. The quartz is surrounded by a reaction-rim of minute prisms of green pyroxene. The conclusion is drawn that these xenocrysts represent portions of the partially crystallized acid magma caught up by the basic magma. The acid dike has some orthoclase phenocrysts bent considerably, and this bending arose, whilst the crystals were softened in the magma, by strains imposed by the flow of a highly viscous melt. Innumerable inclusions of the basic dikes are present, but no assimilation of this material has taken place.

W. A. R.

WALKER (Frederick). *The occurrence of zinc in the Ballachulish granodiorite*. Geol. Mag., 1925, vol. 62, pp. 367-368.

Ludlan's determination of zinc in this rock is confirmed spectroscopically. Its amount is small—not more than 0.01 % ZnO. No zinc-bearing mineral was detected microscopically.

W. A. R.

BROUWER (H. A.). *Bijdrage tot de geologie der Obi-eilanden*. Jaarboek van het Mijnwezen in Nederlandsch Oost-Indië, 1924, vol. 52 (for 1923), Verhand. pp. 3-62, 4 pls., 3 maps, 1 text-fig.

Some account is given of the geology of the Obi islands in the Moluccas. Igneous rocks described are granodiorite, diorites, gabbros,

peridotites and pyroxenites, serpentines, amphibole-pegmatites, lamprophyres, amphibole-andesites, quartz-epidote-rocks, and tuffs. A pyroxene isolated from a chloritized pyroxenite in Great Obi gave on analysis, SiO_2 51.68, Al_2O_3 8.88, Fe_2O_3 0.17, FeO 0.93, CaO 24.74, MgO 12.23, Na_2O 0.62, K_2O 0.05, H_2O 1.74, total 101.04, which resembles the analyses of leucaugite described by A. R. Leeds in 1873 from Amity, New York. The refractive indexes are α 1.68, γ 1.70; sp. gr. 3.0.

W. C. S.

BROUWER (H. A.). *Bijdrage tot de geologie der Radja Ampat eilanden-groep (Waigeo, Salawati, etc.)*. Jaarb. Mijnwezen Ned. Oost-Indië, 1924, vol. 52 (for 1923), Verhand. pp. 63-136, 11 pls., 4 maps, 4 text-figs.

The rocks described from Waigeu and Salawati islands, north-west of Dutch New Guinea, are diorites, diorite-porphyrates and microdiorites, gabbros, serpentines and peridotites, amphibole-rocks, diabase-porphyrates, andesites and basalts, serpentine-conglomerates, and tuffs. No analyses are given. Several of the rocks are figured.

W. C. S.

BROUWER (H. A.). *Geologische beschrijving der omgeving van de Tertiaire fossielrijke lagen nabij Patoenoeang Asoe E in Zuid-Celebes*. Jaarb. Mijnwezen Ned. Oost-Indië, 1924, vol. 52 (for 1923), Verhand. pp. 151-165, 4 pls., 1 text-fig.

Olivine-basalt and shonkinites are described and figured, as well as contact-metamorphosed limestones, and 'stylolites' in a compact foraminiferal limestone.

W. C. S.

DOUBEK (Josef). *Vyvrěliny od labské přehrady v lese Království u Král. Dvora*. (S. analysami dra V. VESELÉHO.)—*Les roches volcaniques du barrage de la Labe dans la forêt Království près de Dvůr Králové*. (Avec analyses chimiques de V. VESELÝ.) Sborník Státního Geologického Ústavu Československé Republiky, 1924, vol. 4, pp. 371-393, 2 pls., with French résumé pp. 393-396.

A picrite, previously described as melaphyre, at the base of the Cretaceous, at this locality in Bohemia, shows three varieties due to differentiation: a biotite-picrite, a biotite-augitite (so named by F. Slavík) sometimes amygdaloidal, and a coarse-grained teschenitic variety. Four analyses are given. Felspar only occurs sporadically in the teschenitic variety, but thomsonite is abundant in all the rocks examined. The pyroxene in the main rock is titanaugite, but in the varieties it is aegirine-augite. The birefringence of successive zones in the crystals of

this mineral have been measured. The transformation of olivine to serpentine (antigorite) can be followed through successive stages: (1) brown coloration; (2) green, pleochroic with grass-green parallel to the c -axis of olivine, α 1.560, β 1.567, γ 1.572; (3) antigorite, with feeble pleochroism and weak double-refraction, α 1.559, β 1.563, γ 1.569; orientation α , γ , β of the antigorite parallel to a , b , c , respectively of the olivine.

W. C. S.

MARCHET (Arthur). *Zur Kenntnis der Amphibolite des niederösterreichischen Waldviertels*. Tschermaks Min. Petr. Mitt., 1924, vol. 36, pp. 170-211, 3 figs.; 1925, vol. 36, pp. 229-320.

Detailed petrographical descriptions with 25 chemical analyses are given of amphibolites, granulites, eclogites, and other rocks from the Waldviertel in Lower Austria. Optical data determined under the microscope are given for the plagioclases, amphiboles, and pyroxenes.

L. J. S.

WOOLDRIDGE (S. W.), with analyses by G. M. STOCKLEY. *The petrology of Sark*. Geol. Mag., 1925, vol. 62, pp. 241-252.

The rocks present consist of a metamorphic complex ranging from gneisses to mica-schists, and resemble those found around Old Lizard Head in Cornwall. Hornblende-schists are the dominant rocks of the island. The hornblende of these rocks is sub-idioblastic and deep green in colour. Epidote is present to a limited extent as a primary metamorphic mineral; as an alteration-product after hornblende; and more commonly in veins associated with quartz and zoisite. Apatite, sphene, magnetite, pyrite, and ilmenite are widely distributed. The gneissose rocks fall mainly in the tonalite family. The hornblende alters to pennine, and is closely associated with biotite. The latter appears to have been formed from the hornblende, around which it forms selvages and even penetrates along cleavages. Zoisite and clinozoisite occur at the contacts of hornblende and felspar crystals. Veins of epidote and zoisite occur also in these acid rocks, and are doubtless hydato-genetic. Xenoliths of the roof rocks are abundant near the contacts, and show a partial transformation to hornblende with biotite.

W. A. R.

TILLEY (C. E.). *Contact-metamorphic assemblages in the system $\text{CaO}-\text{MgO}-\text{Al}_2\text{O}_3-\text{SiO}_2$* . Geol. Mag., 1925, vol. 62, pp. 363-367, 1 fig.

Assemblages of the systems can be divided into three types: (a) Free-silica hornfels assemblages, (b) Quartzless hornfels assemblages (carbonate free), (c) Quartzless hornfels assemblages (carbonate bearing). All the assemblages (a) are found in nature and are characteristic of the shale-

limestone series. All assemblages of (b) are known in the Comrie district of Perthshire. In (c) the gehlenite and monticellite assemblages are rare or absent in nature. These minerals, met with in artificial fusions, are probably unstable under the physical conditions of contact-zones.

W. A. R.

TILLEY (C. E.). *Petrographical notes on some chloritoid rocks*. Geol. Mag., 1925, vol. 62, pp. 309-319, 2 pls., 3 text-figs.

Chloritoid from the Eyre Peninsula, South Australia, has a mica-like habit with a well-developed basal cleavage and an imperfect cleavage probably in the prism-zone. It is black and brittle with hardness 6. Pleochroism is strong, α olive-green, β pale blue, γ yellowish-green. The acute positive bisectrix is nearly normal to (001); $\rho > v$; mean n 1.73, birefringence 0.007. There is simple twinning on the mica-law, giving extinctions of 25° in one lamella and 15° in an adjacent lamella. Hour-glass structure is absent. In the 'chloritoid' of the Woolgarden phyllites at Tintagel, Cornwall, the arrangement of inclusions gives an hour-glass structure. It is optically negative and nearly uniaxial with low birefringence and refractive index much too low for chloritoid. Twinning is multiple, and the twin-lamellae show slightly oblique extinction. This mineral is clearly a member of the chlorite group, and resembles pennine. All these chloritoid-rocks are believed to be the product of dynamic, and not thermal, metamorphism. Chloritoid develops in rocks in which alumina is high and lime low. It may develop at any stage, first appearing in the chlorite zone, but ultimately it gives place to staurolite.

W. A. R.

AGAR (William M.). *Contact metamorphism in the western Adirondacks*. Proc. Amer. Phil. Soc., 1923, vol. 62, pp. 95-174, 6 pls., map, text-figs. [Cf. Abstr., vol. 1, p. 330.]

The crystalline Grenville limestone (pre-Cambrian) of St. Lawrence, Jefferson, and Lewis Cos., north-west New York, is penetrated by numerous igneous masses, ranging from gabbro to granite. The metamorphism is patchy and irregular, and is accompanied by considerable endomorphism. The contacts are of three kinds: (a) narrow bands of thoroughly altered limestone; (b) pockets at or near the contact, or far out in the limestone; (c) disseminated minerals and nodular aggregates in certain areas of limestone. Detailed descriptions are given of material from type localities and optical (microscopic) determinations are given for the various minerals—diopside, diopside-augite, tremolite, hornblende, wollastonite, chondrodite, tourmaline, apatite, spinel, feldspars, and scapolites. A deep-blue, strongly pleochroic amphibole (near soretite) from

Rossie, with α 1.666, β 1.674, γ 1.680, $c:\gamma = 34^\circ$, α light yellow-green, β dark yellow-green, γ dark blue-green, gave analysis I by A. H. Phillips. A diopside-augite from Rossie, with α 1.698, β 1.710, γ 1.728, $c:\gamma = 44^\circ$, gave analysis II by A. H. Phillips.

	SiO ₂ .	TiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	CaO.	MgO.	Na ₂ O.	K ₂ O.	H ₂ O.	Total.
I.	41.68	0.72	11.02	10.77	6.40	0.36	12.01	10.09	4.30	2.65	0.09	100.09
II.	50.01	0.21	3.02	4.80	9.89	0.29	19.97	9.03	2.68	0.52	—	100.42

L. J. S.

GILLSON (Joseph L.). *Zircon, a contact metamorphic mineral in the Pend Oreille district, Idaho.* Amer. Min., 1925, vol. 10, pp. 187-194.

The non-calcareous sediments (Algonkian and Cambrian) of this area contain grains of both detrital and metamorphic zircon. The latter are smaller (less than 0.02 mm.) and more lustrous than the former, and they are abundant in the metamorphosed rocks. In the calcareous rocks, zircon is present only near the contacts with igneous rocks. The conclusion is drawn that there has been a transfer of zirconium from the intrusive into the sedimentary rocks. A review is given of the literature on the metamorphic and pneumatolytic origin of zircon: its presence as large crystals in metamorphic limestones is well known. L. J. S.

BLANCK (E.) & RIESER (A.). *Über die chemische Veränderung des Granits unter Moorbedeckung. Ein Beitrag zur Entstehung des Kaolins.* Chemie der Erde, 1925, vol. 2, pp. 15-48.

A detailed review and discussion is given of the literature on the formation of clay or kaolin by weathering processes, more particularly in association with peat and lignite deposits. Analyses are compared of fresh granite, from the Harz Mts., and of the weathered rock taken from below a layer of peat and from the surface. There is no evidence of the formation of kaolin under these conditions. Sulphuric anhydride was found in the weathered products, in peat, sphagnum-moss, and moor-waters; and it is concluded that this has some action in the weathering processes. L. J. S.

KLANDER (Fritz). *Ueber die im Buntsandstein wandernden Verwitterungslösungen in ihrer Abhängigkeit von äußeren Einflüssen.* Chemie der Erde, 1925, vol. 2, pp. 49-82, 6 pls.

The peculiar forms of weathering shown by the sandstones of Saxon Switzerland and the Palatinate are attributed to the action of circulating solutions containing humus compounds and sulphates derived from the surface vegetation. Analyses are given of the portions extracted by water from the rocks and from the soils derived from them. L. J. S.

DOBRESCU-CLUY (J. M.). *Die Dynamik der Kaliassimilation kalihaltiger Silikat-Mineralen*. *Chemie der Erde*, 1925, vol. 2, pp. 83-102, 3 figs. [Extract from Dissertation published in Roumanian: date not stated.]

Comparative experiments were made of the amounts of potash extracted from phonolite, orthoclase, biotite, and muscovite by (1) water saturated with carbon dioxide, with various proportions of water and mineral; (2) hydrochloric acid of different concentrations; and (3) pot-cultures of oats. For plant growth biotite gave the best results. [Cf. Abstr., vol. 2, p. 186.] L. J. S.

BOSWELL (P. G. H.). *The progress of investigation of the mineralogical composition of sedimentary rocks*. *Proc. Liverpool Geol. Soc.*, 1925, vol. 14, pp. 164-180.

A series of references to recent literature with brief abstracts. [Abstr., vol. 2, p. 348.] L. J. S.

TARR (W. A.). *Is the chalk a chemical deposit?* *Geol. Mag.*, 1925, vol. 62, pp. 252-264.

Three types of material are found in chalk: amorphous or very fine-grained material, spheres, and organic remains. The first represents chemically precipitated calcite and aragonite, and the second a chemically formed oolite. W. A. R.

LINCK (G.) & BECKER (W.). *Die weiße Schreibkreide und ihre Feuersteine*. *Chemie der Erde*,¹ 1925, vol. 2, pp. 1-14.

An outline is given of the various views on the formation of flint in chalk [Abstr., vol. 1, p. 56]. Experiments were made with solutions of colloidal silica (containing 0.5-0.8 % SiO_2) in the presence of precipitated calcium carbonate (vaterite and calcite). The amount of silica adsorbed is greater with smaller sizes of grain of the calcium carbonate. Precipitates obtained from solutions of calcium bicarbonate in the presence of soluble silica contain up to 17 % SiO_2 , the amount depending on the concentration of the solutions. By heating these precipitates in dilute solutions of NaCl, NaOH, NH_3 , &c. at 50°-200° C., a portion of the adsorbed silica passes into solution again. It can be again coagulated by the action of magnesium carbonate or of calcium carbonate solution in

¹ The first volume of this new journal appeared in parts during 1914-19. The title is now somewhat modified: *Chemie der Erde. Zeitschrift der chemischen Mineralogie, Petrographie, Geologie und Bodenkunde*. Herausgegeben von G. Linck und E. Blanck. Jena (G. Fischer).

the presence of sodium chloride. The conclusion is therefore drawn that in the formation of chalk the silica was originally distributed throughout the material, as a pellicle around the minute grains of calcium carbonate. The re-solution of the silica in the presence of alkali and ammonia from organic remains would leave the calcium carbonate with a loose open texture. Migration and coagulation in cavities and crevices would give rise to nodules, bands, and veins of flint. Analyses of chalk from Rügen show 0.81–1.54 % SiO_2 , the amount varying with the distance from the bands of flint.

L. J. S.

KNIGHT (Nicholas). *A chemical study of dolomites*. Proc. Iowa Acad. Sci., 1921, vol. 28, pp. 37–45.

——— *Dolomites from the Austrian Tyrol and other localities*. Ibid., 1922, vol. 29, pp. 349–353.

EVERMAN (Irene), MASON (O'Neal), & BROWNING (Glenn). *The composition of dolomites*. Chem. News, London, 1921, vol. 122, pp. 109–110.

McKAY (Lawrence R.) & MOORE (William A.). *A chemical study of dolomites*. Ibid., 1922, vol. 125, pp. 10–11.

Numerous chemical analyses (and sp. gr.) are given of dolomite-rock and dolomitic limestone, and some of crystallized dolomite, from various localities including the Dolomites in Trentino. Several of the analyses are duplicated in the papers by the different authors. [Cf. Abstr., vol. 1, pp. 75. 172.]

L. J. S.

Economic Minerals and Ore-deposits.

DEWEY (Henry). *The mineral zones of Cornwall*. Proc. Geol. Assoc. London, 1925, vol. 36, pp. 107–135, 1 pl., 2 text-figs.

An extensive review of all available evidence enables a more detailed account of the mineral zones of Cornwall to be given. The following, from the base upwards, are now recognized: (1) Tin with wolfram, in the upper part with tourmaline and quartz; 2,500 feet thick, deposited at temperatures between 575° and 550° C. (2) Sulphides of copper and arsenides, with fluorite replacing tourmaline in the upper part; 2,500 feet thick, deposited at 500° C. (3) Sulphides of lead and silver, giving place in depth to zinc, with baryte and fluorite as gangue; 1,800 feet thick, deposited at 400° C. (4) Sulphide of antimony, 200 feet thick. (5) Carbonates of iron and manganese, 400 feet thick, deposited at 150° C. The ores are distributed along a narrow belt, 10 miles wide, running from Land's End to the southern part of Dartmoor. The tin

and copper occur in the centre of the belt, whilst ores of zinc, silver-lead, antimony, and iron successively approach the margin. This is the clearest example of a mineral belt yet found in Europe. W. A. R.

NORTH (F. J.). *The slates of Wales*. National Museum of Wales, Cardiff, 1925, 66 pp., 8 pls., 7 text-figs. Price 6d.

This is issued as a guide-book to the museum collection. It gives a useful general account of the origin, characters, and composition of slates and their distribution in Wales. Uses and preparation for the market are described, and a short historical account is given of the slate industry in Wales. There is a bibliography of 105 items and an index of localities.

L. J. S.

WAGNER (Percy A.). *On magmatic nickel deposits of the Bushveld complex in the Rustenburg district, Transvaal*. Mem. Geol. Survey, South Africa, 1924, no. 21, 181 pp., 22 pls., 14 text-figs. Price 7s. 6d.

These deposits occur in the lower part of the Bushveld complex, some 30 miles north-west of the town of Rustenburg. The rocks in this part of the complex show a high degree of differentiation, and are pseudo-stratified to a remarkable extent. Within a thickness of some 6,000 feet the following zones have been established: (a) An upper section, composed of bronzitite and diallage-norite, with seams and lenses of chromitite. (b) A middle section, characterized by rapid alternation of bronzitite with harzburgite and anorthositic norite. This section carries the magmatic nickel deposits. (c) A lower section, composed of bronzitite, harzburgite, and serpentine. (d) A basal section of pyroxenitic olivine-norite, with a selvage of quartz-norite. The petrography of the various rocks is described in detail, with chemical analyses of graphic granite, anorthosite, anorthositic norite, diallagic norite, pyroxenitic olivine-norite, bronzitite, harzburgite, chromitite, and serpentine. In a chapter devoted to the origin of the various rocks and structures, the writer adopts Bowen's view that monomineralic rocks such as bronzitite and anorthosite were never molten as such, but represent accumulations of crystals collected under the influence of gravity. The nickel deposits take the form of completely isolated masses composed in part of disseminated sulphides, partly of mottled ore, and partly of massive sulphides. The primary ores are chiefly pyrrhotine, pentlandite, pyrite, and chalcopyrite, with traces of sperrylite and platinum metals, and some gold and silver. Secondary ores include marcasite, chrysocolla, malachite, and iron oxides, while the gangue consists of all the constituents of the bronzitite, and in addition graphite, talc, magnesite, opal,

chalcedony, and quartz. The origin of the deposits is discussed, and the writer concludes that 'droplets of gassy iron-nickel-copper matte separated, at a certain stage in its crystallisation, from the parent norite magma, and were aggregated under the influence of gravity'. Replacement of silicates by sulphides is believed to have played a quite unimportant rôle.

S. J. S.

THIEL (Geo. A.). *Manganese precipitated by micro-organisms*. Econ. Geol., 1925, vol. 20, pp. 301-310, 2 pls. [Cf. Abstr., vol. 2, p. 379.]

The author finds that micro-organisms capable of precipitating manganese are of widespread distribution, and that they may play a part in the deposition of sedimentary manganese ores. Manganese carbonate may be precipitated through the action of sulphate-reducing bacteria on organic solutions; and various types of iron bacteria precipitate manganese as rapidly as they precipitate iron.

T. C.

LINDGREN (Waldemar). *Metasomatism*. (Presidential address.) Bull. Geol. Soc. Amer., 1925, vol. 36, pp. 247-261.

The author defines *metasomatism* as 'an essentially simultaneous, molecular process of solution and deposition by which, in the presence of a fluid phase, one mineral is changed to another of differing chemical composition'. He regards the terms *replacement* and *metasomatism* as being synonymous, but prefers the latter as it is one that may be adopted in all languages. Metasomatism is in some cases governed by the phase rule; but replacements in solid rocks and gel-replacements are rarely governed by simple equations and definite stoichiometric relations, and the phase rule is not directly applicable to them. In this respect the author protests against V. M. Goldschmidt's definition of metasomatism as a process of alteration involving enrichment of a rock 'by definite chemical reactions between the original minerals and the enriching substances'. Colloidal replacement in rocks is dealt with, and its operation in various cases of ore-deposition considered, including the replacement of carbonates by gels of arsenides and sulpharsenides in the ore-deposits at Cobalt, Ontario.

T. C.

LINDGREN (Waldemar). *The cordierite-anthophyllite mineralization at Blue Hill, Maine, and its relation to similar occurrences*. Proc. Nat. Acad. Sci. U.S.A., 1925, vol. 11, pp. 1-4.

The rocks of Blue Hill consist of granite intrusive into schists of sedimentary origin. The schists are Cambrian or earlier in age and were metamorphosed before the intrusion of the granite, which took place in

Silurian or Devonian times. Lenticular masses of pyritic ore, grading into the schist, occur at a distance of $\frac{1}{4}$ –1 mile from the contact. The ores have been formed as a replacement of the schist. Large quantities of cordierite and some anthophyllite have also been formed by replacement in the schist, together with additional biotite. The metallic minerals include magnetite, pyrite, pyrrhotine (with some pentlandite), chalcopyrite, molybdenite, zinc-blende, and rarely, galena. The origin of the deposits is attributed to emanations from the granite, which supplied the replacing iron, magnesia, sulphur, and silica to the invaded metamorphic rocks. The deposits are regarded by the author as similar to those of Bodenmais in Bavaria, Riddarhyttan in Sweden, and Orijärvi in Finland. The author follows Eskola and Geijer in attributing a metasomatic origin to deposits of this type, rejecting the 'injected sulphide' theory of Bergeat, which, as he points out, corresponds closely to the 'ore-magma' theory of Spurr. The author disapproves of the use made by Spurr of the term magma, and suggests that the term should be restricted to 'a liquid of high temperature consisting of a solution of complex silicates in each other, perhaps with admixed oxides and always containing a certain quantity of dissolved volatile matter'. T. C.

LINDGREN (Waldemar), LOUGHLIN (G. F.), & HEIKES (V. C.). *Geology and ore-deposits of the Tintic mining district, Utah*. Prof. Paper U.S. Geol. Survey, 1919, no. 107, 282 pp., 39 pls., 49 text-figs.

The rocks of the district are Palaeozoic sedimentary rocks, including quartzite and limestone with some shale, and Tertiary igneous rocks, including monzonite, rhyolite, and andesites. The ore-deposits are due to replacement and filling along fractures in the monzonite and sedimentary rocks. The chief ore-minerals are enargite and galena, associated with smaller amounts of pyrite, zinc-blende, and tetrahedrite. The characteristic gangue minerals are barytes and quartz. The mineralization is attributed to the action of hot waters of magmatic origin, rich in silica, hydrogen sulphide, and various metallic sulphides, and containing some carbon dioxide. It is thought that the normal ores of the deposits were formed at temperatures ranging from 100° to about 300° C.

T. C.

PAIGE (Sidney). *Copper deposits of the Tyrone district, New Mexico*. Prof. Paper U.S. Geol. Survey, 1922, no. 122, 51 pp., 10 pls., 29 text-figs.

The rocks of the district include pre-Cambrian, Palaeozoic, and Cretaceous to Recent strata, together with pre-Cambrian granites and

Cretaceous or later granodiorites, quartz-monzonites, and other intrusives. The chief copper ore-deposits of the district, which consist of chalcocite in porphyry and granite, owe their formation to enrichment of pyrite and chalcopyrite by descending waters of surface origin. The primary mineralization of the rocks of the district is attributed to the action of aqueous solutions that escaped in large quantities during the late stages of magmatic injection.

T. C.

WANDKE (Alfred). *The Caridad mine, Sonora, Mexico*. Econ. Geol., 1925, vol. 20, pp. 311-318.

The conditions of occurrence of copper ore at the Caridad mine are described. The copper minerals present are enargite, tennantite, and bornite, associated with quartz, sericite, barite, and alunite. The deposits are intimately associated with an intrusion of quartz-monzonite-porphyry. The author infers that the ores are of hypogene origin and he regards the barite and alunite as primary.

T. C.

GILBERT (Geoffrey). *The antipathy of bornite and pyrrhotite*. Econ. Geol., 1925, vol. 20, pp. 364-370.

Evidence is presented to show that 'bornite and pyrrhotite tend to be mutually exclusive, and a specimen (or even an orebody) which contains one of these minerals will not contain the other'.

T. C.

GRAHAM (William A. P.). *Experiments on the origin of phosphate deposits*. Econ. Geol., 1925, vol. 20, pp. 319-334, 1 fig.

The author thinks that humic acids are probably the best natural solvents of phosphorus. Solutions of carbon dioxide dissolve phosphorus and calcium in the ratio of about one part of phosphorus pentoxide to a hundred parts of lime. Neither humic acids nor carbon dioxide, however, are necessary for solvent action, since pure water will dissolve some phosphoric oxide and lime. A solution free from carbon dioxide will leach a larger proportion of phosphorus than lime from a lean phosphate-rock, and vice versa in the case of a rich phosphate-rock. Carbon dioxide solutions thus leave a residue richer in phosphorus by their action on lean phosphate-rock; whereas, when organic acids are active, the process of enrichment is one of solution and re-deposition.

T. C.

SAGUI (Cornelio L.). *Asbestos deposits of Cyprus*. Econ. Geol., 1925, vol. 20, pp. 371-375.

The conditions of occurrence of the asbestos in the Amiando asbestos mine are described, and the origin of the asbestos considered. The author infers that initial cracking of the country-rock and the existence of a

moderate pressure are necessary for the growth of chrysotile. These conditions being present, he regards replacement by the agency of hydrothermal solutions as the chief factor in the growth of chrysotile fibres.

T. C.

ROGERS (G. Sherburne). *Helium-bearing natural gas*. Prof. Paper U.S. Geol. Survey, 1921, no. 121, 113 pp., 4 pls., 16 text-figs.

In this paper an account is given of the distribution of helium in rocks and minerals. In radioactive minerals, the amount of helium is proportional to radioactivity and the amount increases with age, indicating that the helium has been formed by the decay of the radio-elements; but some beryls contain far more helium than can be accounted for in this way. Certain nitrogen-rich natural gases of Kansas, Oklahoma, and Texas, contain 0.5 to 2 % of helium. Natural gases from Tertiary strata in Alsace, Germany, Austria, Italy, and Transylvania are poor in helium. Natural gas from a test-hole in Mesozoic strata in Alsace contained He 0.38 %. Helium is also present in coal-mine gases. Mineral-spring gases contain as much as 10 %. The lower atmosphere contains 0.0004 % of helium, the upper atmosphere more. The origin of helium in minerals and rocks is regarded as being due probably to radioactivity, but it is thought that much of the helium in the earth is primordial, and in this connexion the fact of its occurrence in celestial bodies is mentioned. The author thinks that the helium in natural gas may be either primordial or due to radioactivity; or it may even have been derived in some way from the atmosphere.

T. C.

THIESSEN (Reinhardt). *Origin of the boghead coals*. Prof. Paper U.S. Geol. Survey, 1925, no. 132-I, pp. 121-138, 14 pls.

The yellow bodies of boghead coals are regarded by the author as being derived, not from spores, but from colonial algae of which *Elaeophyton* is a type and living representative. *Elaeophyton* is found in salt lakes and lagoons in South Australia and the islands off the coast. Its cell walls are composed largely of oily material. It accumulates at the surface of the lagoons towards the end of the winter, is blown ashore and forms a rubber-like mass known as coorongite, which is regarded by the author as the peat stage of boghead coal. In size and structure the yellow bodies of boghead coals correspond closely to the colonies of *Elaeophyton*. Specimens of cannel coal examined were found to consist mainly of humic and spore material, but contained, in addition to resin, numerous yellow bodies comparable with those found in boghead coal. The author has planned a fuller investigation of cannel coals, to ascer-

tain how far the yellow bodies of boghead coal enter into their composition.

T. C.

Miscellaneous.

ORLOV (Alexandr). *Klinozoisit a prehnit od Proseče-Vobořiště u Pelhřimova*. [Clinzoisite and prehnite from Proseč-Vobořiště near Pelhřimov, Bohemia.] Publications de la Faculté des Sciences de l'Université Charles, Prague, 1925, no. 39, 28 pp., with 2 pp. French résumé, 2 pls., 2 text-figs.

An amphibolite in contact with granite contains numerous veinlets filled with clinzoisite and later prehnite. The clinzoisite when occurring alone is greenish or pink, with $D\ 3.352$. Refractive indices in the pink portions $\alpha\ 1.702$, $\gamma\ 1.708$, and in the greenish portions slightly higher; $2E\ 98^\circ 20'$ ($2V$ about 55°), $\rho < v$. Pleochroism, α pale greenish-yellow, β violet-amethystine, γ pink. The interference-colour is blue. This clinzoisite is intimately associated with zoisite- β , which shows a grey interference-colour, $2V$ about 50° , $\rho > v$, and pleochroism α pink, β amethystine. The α direction of the zoisite- β is parallel to the γ direction in the clinzoisite, so that the same pleochroic colour appears simultaneously in the two parts. The second variety of clinzoisite, which is constantly associated with prehnite, forms columnar crystals and radiating aggregates and is pale greyish-green with $D\ 3.356$ to 3.60 , $\alpha\ 1.708$ to 1.710 , $\gamma\ 1.720$, $a:c = 2-8^\circ$, $\gamma:a = 18-25^\circ$, $2V\ 80-90^\circ$, $\rho < v$. Twin lamellae (100) are numerous. Some cleavage flakes are zoisite- α with $\gamma\ 1.707$. The clinzoisites from Proseč-Vobořiště have very low refractive indices as compared with those of the normal epidote-clinzoisite series, and they perhaps belong to F. Zambonini's abnormal series of mixed crystals [Abstr., vol. 2, p. 188]. The prehnite has $D\ 2.916$, $\alpha\ 1.613$, $\beta\ 1.620$, $\gamma\ 1.635$, $2V$ about 70° , and shows normal interference-colours. The optical structure is complex, often similar to that of microcline, with fine lamellae parallel to the prismatic (110) and macro-diagonal directions. Pseudomorphs of prehnite after clinzoisite have been found in some cases. Both these minerals have been formed during the process of uralitization and chloritization by thermal solutions of the amphibolite parent-rock.

F. S.

ULRICH (František). *Krystallografie vivianitu z Rodna vecche*. [Crystallography of vivianite from Rodna Vecche.] Rozpravy České Akad., 1925, vol. 23, no. 33, 9 pp., 3 pls.

Vivianite is recorded from Rodna Vecche in Romania (formerly Ó-Radna, Transylvania). The well-developed crystals described are

of the usual elongated habit and show the forms $abymnkwxzrv$, s (131) [Dana's letters] and new μ (102) and ψ (183). The Laue diagram through the face (010) is very rich in spots, and shows a pseudo-hexagonal character marked by the zones [130], [131], [021], [130], [131], [021]. After gliding in the crystal, the reflected spots in the vertical zone remain intact, whilst all others change their position. Sp. gr. 2.678. Optical orientation: $a(Bx_0) = b$, $\gamma:c = 29^\circ$ in the obtuse angle β . Pleochroism: a deep blue, β pale bluish-green, γ pale yellowish-green. α 1.5816, β 1.6042, γ 1.6365, $2V$ $80^\circ 56'$. Apparent twin-lamellae on (010), corresponding approximately with the orthodome (302), show a stronger coloration and pleochroism and higher refraction. These are due to commencing oxidation of the vivianite, as demonstrated by heating the crystals in hydrogen peroxide. F. S.

ZIMÁNYI (Károly). *Kristálytani vizsgálatok Krassó-Szörény vármegye pyritjein.* Math. Természuttud. Értesítő, Budapest, 1925, vol. 41, pp. 152–157 (Hung.), p. 158 (Germ.).

ZIMÁNYI (Karl). *Kristallographische Untersuchungen an den Pyriten des Komitates Krassó-Szörény.* Zeits. Krist., 1925, vol. 62, pp. 506–528, 5 pls., 5 text-figs.

Crystallographic descriptions are given of pyrites from Dognácska, Vaskő, and Majdan, together with a sketch of their geological and mineralogical occurrence. On crystals from the 'Good Friday' mine, at Dognácska, the following 77 forms were observed: $a, o, d, b, c, \delta, J, C, h, A, \gamma, \epsilon, f, D, k, \mathfrak{G}, O, e, \kappa, \theta, D, v, \sigma, \Lambda', \xi', \pi', \sigma', v', D', \theta', \Gamma', g', h',$ (665), (554), (443), r , (553), (774), p, μ , (722), ω, ψ, n , (11.6.6), (955), (744), (12.7.7), (533), (855), (10.7.7), (544), II, (766), (16.7.4), (16.18.1), (18.9.2), w , (10.5.2), $t, \mathfrak{h}, j, R, Y, \Sigma, s$, (10.7.4), M, G, \mathfrak{B} , (13.11.9) (876), (563), (463), (483), (5.20.2) [Dana's letters; see also Földtani Közlöny, 1912, vol. 42, p. 729]. The diploid (13.11.9) is new [Abstr., vol. 2, p. 177]. The habit of the crystals is octahedral, pyritohedral, hexahedral, or dyakisdodecahedral, or the forms $oaes$ are equally developed. Doubtful or vicinal forms are: (13.14.0), (22.11.2), (32.16.5), (843) in the zone [210, 001]; (27.25.23) in the zone [210, 111]; (15.8.3) in the zone [10.6.1, 522]; (23.19.14) in the zones [10.6.1, 111] and [211, 121]; and the negative diploid (6.10.5) in the zone [100, 021]. Natural etch-figures on the faces o, e, t . Crystals from the 'Markus' and 'Four Evangelists' mines, at Dognácska, show the forms $aoen\theta$ and $aoest$ respectively; from the Theresia mine, Vaskő, $eoan$; and from the 'St. George' mine, Majdan, aoe . K. Z.

PECK (Albert B.). *Note on andalusite from California: a new use and some thermal properties.* Amer. Min., 1924, vol. 9, pp. 123-129. 1 fig.

— *Changes in the constitution and microstructure of andalusite, cyanite, and sillimanite at high temperatures and their significance in industrial practice.* Journ. Amer. Ceramic Soc., 1925, vol. 8, pp. 407-429, 11 figs.; Amer. Min., 1925, vol. 10, pp. 253-280, 11 figs.

An andalusite-rock containing 75-85 % andalusite, with associated lazulite, pyrophyllite, muscovite, corundum, and rutile, occurs on White Mountain in the Inyo Range, Mono Co., California. It varies in texture from coarsely columnar to finely granular, and in colour from grey to pale apple-green. In cavities are large (5 inches) rough crystals with the forms *k* (120) and *r* (101) [Dana's axes]. This material is mined (about 70 tons per week) and takes the place of artificial 'sillimanite' in the manufacture of the porcelain cores of sparking plugs.

When heated at about 1390° C. it changes into a parallel aggregate of fibres of mullite [Abstr., vol. 2, pp. 303, 377] with interstitial glass (*n* 1.54), the sp. gr. changing from 3.29 to 3.20. This mullite has α 1.643, γ 1.657, and for the portion insoluble in 20 % HF the composition SiO_2 31.98, Al_2O_3 68.02, corundum 1.50, rutile 1.77 %, corresponding approximately with the formula $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$. Kyanite is transformed at about 1370° C. into an interlocking aggregate of mullite fibres with interstitial glass, there being here a greater change in sp. gr. from 3.59 to 3.09. This mullite has α 1.642, γ 1.655, and gave an analysis SiO_2 27.37, Al_2O_3 72.63, corundum 1.39 %. Fibrolite showed no change at the highest temperature of the experiments (cone 15, about 1430° C.). The presence of 'sillimanite' (mullite) in ceramic ware has been known since 1873. A review of the literature and bibliography are given. For increasing the amount of this constituent the addition of andalusite is specially suitable, since it is transformed at a moderate temperature and with little change in volume. It can therefore be mixed with the clay body before firing.

L. J. S.

NEUMANN (Fritz). *Über die Stabilitätsverhältnisse der Modifikationen im polymorphen System Al_2SiO_5 .* Zeits. Anorg. Chem., 1925, vol. 145, pp. 193-238, 1 pl., 13 text-figs.

— *Berechnung der Stabilitätsverhältnisse der Modifikationen in polymorphen System Al_2SiO_5 .* Neues Jahrb. Min., 1925, Beilage-Pand 53, Abt. A, pp. 1-58, 1 pl., 13 text-figs.

The specific heat and the heat of solution (in 40 % HF) were deter-

mined for andalusite, kyanite, and fibrolite. These data are applied in Nernst's heat theorem, and from the 'A—U' (work-energy) diagram for the pair andalusite-fibrolite, it is concluded that fibrolite is the stable modification up to 1487° C., and that andalusite is stable above this temperature. Kyanite as compared with fibrolite is completely unstable. Direct experiments show, however, that when heated at 1200° andalusite changes into mullite + glass. Kyanite shows the same change at 1400°. Fibrolite shows no change at 1300° C. L. J. S.

GREIG (J. W.). *Formation of mullite from cyanite, andalusite and sillimanite.* Journ. Amer. Ceramic Soc., 1925, vol. 8, pp. 465–484, 18 figs.

A thermal and microscopical study of these three minerals shows that on heating all of them are decomposed into mullite and silica (probably cristobalite). Decomposition takes place at no definite temperature, but is lowest for kyanite and highest for fibrolite. Above 1050° C. only mullite, $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$, is stable. With kyanite and andalusite the change commences on the surface of the grains, and the decomposition is accompanied by an absorption of heat; while in fibrolite the change appears to take place throughout the grain. In andalusite and fibrolite the mullite needles are oriented parallel to the original crystal. In all cases the products are lower in density than the original mineral. L. J. S.

WALLACE (R. C.). *An unusual occurrence of cyanite.* Amer. Min., 1924, vol. 9, pp. 129–135. 2 figs.

Tufts of reddish kyanite occur in a band of kyanite-schist near a granite contact in the Wekusko series of pre-Cambrian sediments of northern Manitoba. An adjoining staurolite-schist contains tufts of white kyanite; and in a chlorite-schist are large crystals of garnet. L. J. S.

THOREAU (J.). *Sur la découverte d'un nitrate de cuivre, la gerhardtite, au Katanga.* Ann. Soc. Géol. Belgique, 1924, vol. 46, Bull. pp. B 285–B 290, 4 figs.

Small ($1\frac{1}{2}$ – $2\frac{1}{2}$ mm.) emerald-green crystals of this rare mineral (previously known only from Arizona) were found in cavities in cuprite from the Likasi mine, Katanga, Belgian Congo. Chemical tests show it to be a [basic] copper nitrate insoluble in water. The crystals are orthorhombic with $a:b:c = 0.92062:1:1.14983$ (from $mm = 85^\circ 16'$ and $cp = 59^\circ 30'$, Dana's letters). The basal plane is large and bright;

the pyramid zones are striated and show an irregular distribution of faces (7.7.18), (112), (11.11.20), (223), (25.25.26), (111), (221), (441). Cleavage (001) perfect, (100) less perfect. Sp. gr. 3.40, H. 2. The plane of the optic axes is (010), and the acute positive bisectrix \perp (001) [not negative, as in Dana]. Approximate optical measurements are given.

L. J. S.

GROUT (F. F.). *Notes on biotite*. Amer. Min., 1924, vol. 9, pp. 159-165. 1 fig.

Four detailed and two partial analyses are given for biotite separated from granites and associated rocks occurring in Minnesota. In a selected series of biotites, the magnesia is shown to diminish as the ferrous iron increases, while both α and γ indices increase with the ferrous iron content.

A. F. H.

MINGAYE (J. C. H.). *Occurrence of halotrichite, East Greta colliery*. Bull. Geol. Survey N. S. Wales, 1925, no. 6, p. 154. (Appendix III in 'The coal resources of New South Wales'.)

The white material described is formed by the rapid oxidation of pyrites in the rock. After cleaning off a growth of the crystals from the rock surface, a fresh dense growth formed again during the following week. An analysis of the halotrichite gave: FeO 9.90, Fe₂O₃ trace, Al₂O₃ 8.82, MnO 0.10, MgO 0.77, K₂O 0.17, Na₂O 0.45, SO₃ 34.52, P₂O₅ trace, insol. 2.24, H₂O (diff.) 43.03 %.

T. C.

RENICK (B. Coleman). *Base exchange in ground water by silicates as illustrated in Montana*. Water-Supply Paper, U.S. Geol. Survey, 1924, no. 520-D, pp. 53-72, 3 pls., 1 text-fig.

The author finds that water near the surface is relatively high in calcium and magnesium, these being exchanged for sodium with increasing depth. The result is a natural softening. This exchange of bases is attributed chiefly to the effect of minerals of 'the leverrierite group', which are abundant in the Tertiary strata of the district. Felspar, mica, and kaolinite are also present in the rocks, and may assist in effecting the exchange, which is accomplished by the time a depth of 125 feet or less is reached. The water shows no tendency to dissolve more material with increasing depth.

T. C.

BRALY (Ad.). "*Grillage sous verres*." *Suppression des verres de montres percés et leur remplacement par des verres ordinaires*. Bull. Soc. Franç. Min., 1923, vol. 46, pp. 7-8, 1 fig.

The pierced watch-glass previously employed may advantageously be

replaced by a simple glass slightly overlapping the mica plate to allow a current of air. [See Abstr., vol. 1, p. 295.] E. D. M.

TERMIER (Pierre). *Sur la présence de la leverrierite dans les Tonstein du houiller de la Sarre.* Bull. Soc. Franç. Min., 1923, vol. 46, pp. 18-20.

The clay bands of the Saar coal-field are about 20 cm. thick and of various shades of grey. They contain small crystals of leverrierite with quartz, carbonaceous material, carbonates, and sometimes mica and chlorite. Their bulk-composition shows the ratio $\text{Al}_2\text{O}_3 : \text{SiO}_2$ varying from 1:2 to 1:4. E. D. M.

ABRARD (René). *Présence de l'apatite dans les pegmatites des environs de Dinard.* Bull. Soc. Franç. Min., 1923, vol. 46, p. 5.

Pegmatite-veins occurring in the neighbourhood of St. Malo contain, at several points, massive green apatite and prisms 7 or 8 mm. across, together with quartz, microcline, muscovite, and tourmaline. E. D. M.

WHITLOCK (Herbert P.). *Crystallographic studies of apatite.* Amer. Museum Novitates, New York, 1925, no. 190, 4 pp., 1 fig.

A crystallographic study of a series of crystals from Branchville, Connecticut. The crystals are milk-white in colour, flattened parallel to the base, and somewhat stepped and rounded in outline. They range from 2 mm. to 1 cm. in size and are rich in faces. Twenty forms were observed of which eight, all third-order pyramids in the zone between $s(11\bar{2}1)$ and $a(1\bar{0}10)$, are new, namely $S(32\bar{5}2)$, $M(9.4.1\bar{3}.4)$, $M_1(52\bar{7}2)$, $N(72\bar{9}2)$, $T(51\bar{6}2)$, $U(71\bar{8}1)$, $V(81\bar{9}1)$, $Y(10.1.1\bar{1}.1)$. F. N. A.

HEVESY (George) & JANTZEN (Valdemar Thal). *The hafnium content of zirconium ores.* Chem. News, 1924, vol. 128, pp. 341-342.

HEVESY (G. v.) & JANTZEN (V. Thal). *Über die Hafniumgehalt von Zirkon-Mineralien. II.* Zeits. Anorg. Chem., 1924, vol. 136, pp. 387-392, 1 fig. [Cf. Abstr., vol. 2, p. 288.]

Further zirconium-bearing minerals examined for hafnium by the X-ray spectrum-analysis method, include: blue transparent zircon from Siam (HfO_2 3.5%), malacon from Hitterö (5), malacon from Madagascar (5, or 7%), zirkelite (1.2), elpidite (0.4), pyrochlore (0.1), baddeleyite crystal (3), thortveitite from Norway and Madagascar (1.1 to 3.2). In thortveitite the amount of hafnium exceeds that of zirconium (ZrO_2 0.8 to 2.2%). The fig. in the second paper gives the X-ray spectrum of

thortveitite from Norway, showing the presence of ytterbium, cassiopeium, and hafnium.

L. J. S.

HEVESY (George) & JANTZEN (Valdemar Thal). *The hafnium content of zirconium ores II.* Chem. News, London, 1925, vol. 130, pp. 179-180.

The series of twenty zircons from various localities for which A. Piutti (1909) determined the helium content, radioactivity, and density were examined for hafnium. The hafnium content (HfO_2 0.7 to 4.0 %) shows no relation to the density (4.048 to 4.748) and only a rough relation to the radioactivity. The hafnium was re-determined in the zirconium minerals previously examined [Abstr., vol. 2, p. 288]. The ratio $\text{HfO}_2/\text{ZrO}_2$ averages 0.015 in minerals from alkali-rocks (nepheline-syenites) and 0.04 for minerals from more siliceous rocks (granites).

L. J. S.

HEVESY (G. de). *Recherches sur les propriétés du hafnium.* K. Danske Videnskab. Selskab, Math.-fys. Meddel., 1925, vol. 6, no. 7, 149 pp., 2 pls., 40 text-figs.

A connected account is given of the discovery and properties of the new element hafnium (no. 72, at. wt. 178.6). [Abstr., vol. 2, pp. 49, 288.] The extent to which it is present in various zirconium minerals is noted. It is not present in thorium minerals. Baddeleyite contains HfO_2 0.5-1.2 %, zircon 0.5-4, alvite 4.6, cyrtolite from Rockport, Mass., 17, thortveitite 0.5-1 %, &c. Some account is given of earlier work on zirconium and the related elements 'norium', 'nipponium', 'jargonium', 'nigrium', and 'celtium'. A bibliography is wanting.

L. J. S.

BEDR-CHAN (Safder). *Analyse des Alvits.* Zeits. Anorg. Chem., 1925, vol. 144, pp. 304-306.

A new analysis of alvite gave (mean of two): SiO_2 25.65, TiO_2 + Nb_2O_5 + Ta_2O_5 0.63, CaO 2.08, MgO 1.11, ThO_2 + Ce_2O_3 + Y_2O_3 2.76, Fe_2O_3 7.57, ZrO_2 + HfO_2 46.58, Al_2O_3 + BeO 4.55, H_2O 6.30, total 97.23. X-ray analysis by V. T. Jantzen of the mixed oxides showed the presence of hafnia 10 %, corresponding in the mineral to HfO_2 4.66, leaving for ZrO_2 41.92 %.

L. J. S.

GORDON (Samuel G.). *Mineralogical notes, 1-10.* Proc. Acad. Nat. Sci. Philadelphia, 1925, vol. 77, pp. 1-13, 5 figs.

(1) The crystallography and optical properties of ancylite.—Small rounded crystals from Narsarsuk, Greenland, when silvered on the surface yielded approximate measurements from the faces $d(120)$ and

$e(111)$, giving the axial ratios $a:b:c = 0.571:1:0.534$. The crystals are optically negative $\alpha (= a)$ 1.625, $\beta (= b)$ 1.700, $\gamma (= c?)$ 1.735. (2) Variscite (= peganite = lucinite) and other phosphates, from Moore's Mill, Cumberland County, Pennsylvania.—In the wavellite deposit, formerly worked for phosphorus at this locality, the following phosphates associated with limonite are noted and their optical constants are given: wavellite, beraunite, cacoxenite, variscite, barrandite, and strengite. Globosite is probably identical with strengite. (3) Optical properties of barrandite from Bohemia.—The white radiating fibres from Cerhovic show straight extinction with positive elongation, α 1.650, γ 1.680. (4) Jarosite from Midvale, Virginia.—Minute crystals of jarosite occur with strengite in cavities in dufrenite veins in ferruginous sandstone; $cr = 53^\circ 12'$ ($a:c = 1:1.158$), ϵ 1.706, $\omega > 1.78$. (5) Alunite from Llallagua, Bolivia.—Compact white alunite has sp. gr. 2.726 and mean refr. index 1.580. (6) Rhomboclase from Cerro de Pasco, Peru.—Old workings in the pyritic ore of the Esperanza mine contain stalactites and efflorescences of rhomboclase, chalcantite, pisanite, epsomite, and goslarite. (7) Pyromorphite from Broken Hill, N.S.W.—Colourless to pale-buff, transparent crystals with the forms *a m r*. (8) The probable identity of chlorotile with mixite.—Crystals of chlorotile from Schneeberg, Saxony, are optically uniaxial with ω 1.785, $\epsilon > 1.74$, and gave a reaction for bismuth. (9) The probable identity of schoepite and becquerelite.—By re-orienting the crystals they are shown to have the same axial ratios. (10) An error in the recorded optical properties of daviesite.—The data given by E. S. Larsen (1921) are those of caracolite.

L. J. S.

ORCEL (J.). *Sur un type nouveau de chlorite blanche alumineuse.*

Compt. Rend. Acad. Sci. Paris, 1924, vol. 178, pp. 1729–1731.

The mineral occurs in serpentine and talc in the Comberousse valley, Belledonne Mts., Isère. It forms pale-green crystalline masses resembling talc, but has a saccharoidal fracture. Under the microscope it shows a minute spherulitic structure. The acute positive bisectrix is a little inclined to the pearly cleavage; $2E$ about 20° , α 1.578, β 1.581, birefringence near that of clinocllore (hence γ about 1.588). Sp. gr. 2.67. Analysis, SiO_2 27.12, Al_2O_3 27.68, Fe_2O_3 0.20, FeO 1.24, MnO 0.54, MgO 30.96, H_2O at 108° 0.01, H_2O at 725° 2.65, H_2O at 880° 10.17 = 100.57, gives the formula $9MgO.3Al_2O_3.5SiO_2.8H_2O$. This chlorite is intermediate between the magnesian prochlorites and corundophyllite. [Cf. Abstr., vol. 2, p. 189.]

L. J. S.

ORCEL (J.). *Sur une chlorite blanche de Madagascar*. Compt. Rend. Acad. Sci. Paris, 1925, vol. 180, pp. 1672-1674.

Large (10 cm.) plates of pale-amber chlorite come from Midongy, prov. Ambatofinandrahana. Cleavage flakes are perfectly colourless and transparent. $D\ 2.735$; $\alpha\ 1.5749$, $\beta\ 1.5754$, $\gamma\ 1.5904(\text{Na})$, $2E\ 28-30^\circ$. A thickness of 0.3 mm. insulates 15,000 volts. Analysis, $\text{SiO}_2\ 30.31$, $\text{Al}_2\text{O}_3\ 21.72$, Fe_2O_3 nil, $\text{FeO}\ 0.56$, MnO trace, $\text{MgO}\ 34.63$, $\text{H}_2\text{O} +\ 13.30$, total 100.52, gives the formula $12\text{MgO} \cdot 3\text{Al}_2\text{O}_3 \cdot 7\text{SiO}_2 \cdot 10\text{H}_2\text{O}$, agreeing with leuchtenbergite. L. J. S.

ORCEL (J.). *Sur deux clinochlores chromifères du Togo*. Compt. Rend. Acad. Sci. Paris, 1925, vol. 180, pp. 836-838.

Blocks of chromite from Patevi, 20 km. SSE. of Atakpame show on the surface small scales of violet and green chlorite. The violet has $D\ 2.673$, $\gamma\ 1.579$, and gave analysis I. The green has $D\ 2.657$, $\gamma\ 1.571$, analysis II. They are optically positive with small axial angle.

	SiO_2	Al_2O_3	Cr_2O_3	Fe_2O_3	FeO	MgO	$\text{H}_2\text{O} +$	Total.
I.	31.78	15.24	4.16	0.47	1.20	34.87	12.48	100.20
II.	32.42	16.95	0.85	0.62	1.05	35.88	12.79	100.56

Both analyses give the formula $5\text{MgO} \cdot (\text{Al,Cr})_2\text{O}_3 \cdot 3\text{SiO}_2 \cdot 4\text{H}_2\text{O}$. The violet colour is due to chromium, and the green to iron. L. J. S.

TUČAN (Fran). *La kämmererite des chromites de Yougoslavie*. Compt. Rend. Acad. Sci. Paris, 1924, vol. 178, pp. 1911-1913.

Chromium-bearing chlorites, especially kämmererite, are found in crevices and cavities in chromite at several localities in Yugoslavia (Bosnia, Serbia, Macedonia). Analyses I, from Ela Virote south of Alchar, and II, from Arnitchko east of Rojden, show the material to be kämmererite, the formulae being $(\text{Cr,Al})_2\text{Si}_4\text{O}_{22}\text{Mg}_6\text{H}_{10}$ and $(\text{Cr,Al})_2\text{Si}_3\text{O}_{20}\text{Mg}_6\text{H}_{10}$ respectively. Optically, they are almost uniaxial. Water is lost at over 300° . Both before and after ignition, the mineral is slowly and almost completely decomposed by HCl .

	SiO_2	Al_2O_3	Cr_2O_3	FeO	MgO	H_2O	Total.	Sp. gr.
I.	38.03	7.20	10.19	0.96	36.17	12.88	100.43	2.59
II.	31.33	8.28	11.72	1.09	34.73	13.13	100.28	2.67

L. J. S.

WALDSCHMIDT (W. A.). *Titanium bearing jefferisite from Westcliffe, Custer County, Colorado*. Amer. Min., 1924, vol. 9, p. 113-116.

Dark-brown plates up to 5 inches across occur in peridotite and also in granite-gneiss at this locality. Sp. gr. 2.38; optically biaxial and

negative with small angle. Before the blowpipe it exfoliates with a fourteenfold increase in thickness. Analysis by A. H. Low gave: SiO_2 36.28, TiO_2 1.74, Al_2O_3 15.92, Fe_2O_3 6.35, FeO 8.61, MgO 15.99, CaO 1.19, H_2O 10.98 = 97.06. The mineral is roasted and used commercially for the same purposes as powdered mica. L. J. S.

BIANCHI (Angelo). *Quarzo di Val Devero (Ossola)*. Atti (Mem.) R. Accad. Lincei, Cl. Sci. fis. mat. Roma, 1923, ser. 5, vol. 14, pp. 57-80, 1 pl.

— *II „Tessinerhabitus“ di Koenigsberger nei quarzi di Val Leventina e di Val Devero*. Atti (Rend.) R. Accad. Lincei, Cl. Sci. fis. mat. Roma, 1923, ser. 5, vol. 32, sem. 2, pp. 243-249, 2 figs.

A detailed crystallographic study of quartz from various occurrences in calc-schists and gneisses in the Val Devero, Piedmont. On 83 measured crystals 98 forms were noted, of which 29 are new, some being vicinal and uncertain. The second paper compares the quartz crystals of this locality with those of the Val Leventina in Ticino [= Tessin]. Two more new forms are noted. The 'Tessin habit' of J. Koenigsberger (1919; Abstr., vol. 1, p. 328) is characterized by the predominance of the acute rhombohedra (3031) or (5053). L. J. S.

ERNST (E.) *Über Olivin von Önundarfjörd, NW-Island.—Ein Beitrag zur Kenntnis der Olivingruppe*. Neues Jahrb. Min., Abt. A, 1925, Beilage-Band 52, pp. 113-156, 5 figs.

A large lot of small loose crystals of olivine from this locality were examined in detail. They vary in colour, density (3.341-3.522, this variation being partly due to inclusions), &c. Analyses are given of: I clear green, II brownish-green, and III green-brown crystals, corresponding with 10 about, 16.20, and about 22 mol. % Fe_2SiO_4 .

	SiO_2 .	FeO .	MnO .	NiO .	CaO .	MgO .	Total.	Sp. gr.
I.	38.89	11.68	0.24	0.00	0.22	49.55	100.58	3.343
II.	40.94	14.03	1.11	0.36	0.25	44.20	100.89	3.404
III.	38.09	20.31	0.42	0.00	0.15	40.89	99.86	3.471

Selected constants determined on material of the corresponding colours are:

	$a : b : c$.	α_{Na} .	β_{Na} .	γ_{Na} .	$2V_{\alpha}$.
I.	—	1.6528	1.6697	1.6885	92° 12'
II.	0.4670 : 1 : 0.5869	1.6628	1.6811	1.7000	90 1
III.	0.4650 : 1 : 0.5841	1.6801	1.7008	1.7197	86 22

Detailed optical determinations are given for several crystals of various colours; these are compared with data taken from the literature

and with the chemical composition. The paler crystals poorer in iron are optically positive and the brown crystals negative, whilst the medium material is positive for red and negative for blue light.

L. J. S.

KRIESEL (F. W.). *Über die Analyse des neuen Germanium-Gallium-Minerals „Germanit“*. Chemiker-Zeitung, 1924, vol. 48, pp. 961-963. [Cf. Abstr., vol. 2, 252.]

The mean of several new analyses made on large amounts of selected material, gave: Cu 45.39, Pb 0.66, Zn 2.58, Fe 4.56, Ge 8.70, S 30.65, As 4.13, Ga 0.76, SiO₂ 0.226, WO₃ 0.184, TiO₂ 0.004, Mo 1.282, Mn 0.02, Ni 0.001, Co 0.013, Cd 0.071, CaO 0.122, MgO 0.055, C 0.136, Ag, Au 0.005, Ba, V, Bi, Se, Te nil, total 99.549. Details of the methods of analysis are given. Analysis of the associated tennantite gave: Cu 44.50, Pb 0.35, Zn 7.28, Fe 0.62, Ge 0.14, Mo nil, S 27.58, As 18.76, Sb trace, Se, Te 0.06, Ag, Au 0.022, SiO₂ 0.06, total 99.372.

L. J. S.

SUNDIUS (N.). *Optische Bestimmungen an FeCO₃, MnCO₃ und CaMg(CO₃)₂*. Geol. För. Förh. Stockholm, 1925, vol. 47, 269-270.

Material analysed by A. Bygdén and used by J. A. Hedvall for thermal dissociation experiments (tom. cit., p. 73): I, dolomite from Taberg, Sweden; II, chalybite from Ivigtut, Greenland; III, rhodochrosite from Alma, Colorado, gave:

	Molecular percentages.				Sp. gr.	ω_{Na} .	ϵ_{Na} .	Cleavage angle.
	FeCO ₃ .	MnCO ₃ .	MgCO ₃ .	CaCO ₃ .				
I.	3.96	1.32	43.70	51.02	2.900	1.688	1.508	73° 48'
II.	94.84	4.63	0.42	0.14	3.927	1.873	1.633	73 3
III.	1.60	97.83	0.58	—	3.691	1.816	1.600	73 2

L. J. S.

SCHOEP (Alfred). *Sur la planchéite et sur la shattuckite. Identité de composition chimique des deux minéraux*. Ann. Soc. Géol. Belgique, Liège, 1925, vol. 48, Bull. pp. B 179-B 185.

Blue spherulites of plancheite embedded in and intermixed with calcite from Tantara, Belgian Congo [Abstr., vol. 1, p. 416] gave α 1.665, γ 1.720, and analysis SiO₂ 39.32, CuO 44.99, CaO 3.43, H₂O 5.74, CaCO₃ 6.25, Co₃O₄ 0.49, total 100.22. This gives the formula 2(Cu,Ca)O.2SiO. H₂O, identical with that of shattuckite. The difference in the refractive indices of plancheite and shattuckite [Abstr., vol. 1, p. 10] may perhaps be due to the partial replacement of copper by calcium, but the author

inclines to the view that there is a difference in the crystalline structure, the two minerals being dimorphous. This might be decided by X-ray analysis or by the dehydration curves. The dehydration curve is given for plancheite.

L. J. S.

BUTTGEBACH (H.). *Nouvelles observations sur des cristaux de schoepite*. Ann. Soc. Géol. Belgique, Liège, 1924, vol. 47, Bull. pp. B163-B167, 2 figs.

Minute ($\frac{1}{2}$ mm.) crystals of schoepite on becquerelite lining crevices in pitchblende from Chinkolobwe, Katanga, show the same forms as recorded by T. L. Walker [Abstr., vol. 2, p. 147], but the crystals differ in being flattened parallel to (001). New values for the parameters are $a:b:c = 0.42757:1:0.89986$. The birefringence $\gamma - \beta$ on (001) is 0.025. The differences in the optical characters of schoepite and becquerelite are noted. On crystals of becquerelite a new form (103) is recorded. [Abstr., vol. 2, p. 383.]

L. J. S.

HLAWATSCH (C.). *Wolfsbergit von Schwaz*. Mitt. Wien. Min. Gesell., for 1921, no. 82, pp. 17-19, issued with Tschermaks Min. Petr. Mitt., 1922, vol. 35 (for 1921).

A specimen found in 1856 at Schwaz, Tyrol, shows large crystals of tetrahedrite on massive grey dolomite with quartz and white rhombohedra of dolomite. The tetrahedrite is rough and corroded, and is encrusted with minute prismatic crystals which are identified as wolfsbergite (= chalcostibite, CuSbS_2). These show the forms c (001), g (201), and u (061) [Penfield's orientation, 1897].

L. J. S.

[CHIRVINSKY (P. N.)] TSCHIRWINSKY (Peter). *Avanturinlabrador aus Poromowka, Shitomir-Distrikt, Gouv. Wolynien*. Zeits. Krist., 1925, vol. 62, pp. 137-144, 2 figs.

Like the labradorite from the gabbro-norite rocks of govt. Kiev, this shows a blue reflexion on the plane b (010). As observed by V. Tarasenko, thin sections parallel to b (010) show minute (0.36-0.76 mm.), black or brown, acicular or platy inclusions, which are probably ilmenite, or perhaps sometimes haematite.

L. J. S.

PORTER (Mary W.). *Note on occurrence of struvite*. Amer. Min., 1924, vol. 9, pp. 93-94, 2 figs.

Small (1-3 mm.) crystals taken from human lungs were identified by the Fedorov method as struvite. They show the forms $c b s q h p$ [Dana's letters].

L. J. S.